A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME IX.

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ERRATA IN VOLUME IX.

Page 26, column 1, for *Rhyncophorus* read '*Rhynchophorus*'.
„ 41, last paragraph, delete ' and Jamaica .
„ 42, column 1, for *Papilio demolens* read '*Papilio demoleus*'.
„ 42, legend, for Figure 19, read ' Figure 5 '.
„ 47, column 2, for *Margaropus annulatas* read '*Margaropus annulatus*'
„ 57, column 1, for *Hevea braziliensis* read '*Hevea brasiliensis*'.
„ 85, column 2, paragraph 7, line 2, delete ' not '.
„ 89, column 1, for *Hevea brazilensis* read '*Hevea brasiliensis*'.
„ 94, columns 1 and 2, for Chitredineae read ' Chytridineae '.
„ 107, column 2, last paragraph, for successful read ' successive '.
„ 122, column 2, last paragraph, for misile read ' missel '.
„ 127, column 1, for Vol. VIII, p. 200, read ' Vol. VIII, p. 411'.
Pages 127 and 175, column 1, for *Sphaerostilbe flavidum* read *Sphaerostilbe flavida*'.
Page 170, column 2, for *Sarchophaga trivittata* read '*Sarcophaga trivittata*'.
Pages 187, column 2, and 194, column 2, footnote, for *Journal of the Royal Horticultural Society*, read '*Journal of the Royal Agricultural Society*'.
Page 207, column 1, last paragraph for 1s. 4*d.* per lb. for small and medium, and 1s. 2*d.*, read ' $\frac{1}{4}$*d.* per lb. for small and medium, and $\frac{1}{2}$*d*'.
„ 274, column 2, for *Libor Exoticorum*, read '*Liber exoticorum*'.
„ 313, column 2, line 2, for No. 4,451, read 'No. 4,511'.
„ 314, column 2, last paragraph, for quality read 'qualities'.
„ 335, column 1, for *Lasiodiplodia theobroma*, read '*Lasiodiplodia theobromae*'.
„ 347, column 2, for *Heliothrips rubrocintus*, read '*Heliothrips rubrocinctus*'.
„ 350, column 2, for *Penicillium anisotliae*, read '*Penicillium anisopliae*'.
„ 354, column 1, line 16, for change read ' charge.'
„ 398, column 1, for *Andropogon Sorghum*, var. *vulgare*, read '*Andropogon Sorghum*, var. *vulgaris*'.

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A FORTNIGHTLY REVIEW OF THE IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Mutual Insurance of Live Stock.

IN several European countries, especially in Holland, the insurance of live stock among small proprietors, on a mutual basis, has attained a great importance. This is not only the case in those countries whose products are mainly agricultural, for the system is widely adopted in a manufacturing country such as England, in some parts of which, it has been in existence for many years. Evidence of this is given in a recently issued Leaflet (No. 221) of the Board of Agriculture and Fisheries, which states that, in 1905, the number of pig clubs, alone, in England was at least 1,021; it also shows that clubs for the mutual insurance of live stock have existed in that country since the year 1807, though it is tolerably certain that unregistered societies had already been formed for some time. As has just been mentioned, Holland, of European countries, is the one in which the system has been most largely adopted; it has also attained large proportions in Denmark, Norway and France (see *Agricultural News*, Vol. VII, pp. 302, 383). At the present time, efforts are being made to introduce it into South Africa.

It would appear that there is room for the introduction of such a system into some of the West Indian Islands, such as Barbados, with its large peasant population, and St. Vincent, where the Land Settlement Scheme is fostering the increase in the number of small proprietors. These are merely taken as special cases. There is little doubt that various causes are contributing toward the increase in numbers of the peasant proprietor in several West Indian Islands, one of them being the adoption of central factory methods of sugar-making. In view of these facts, it may not be out of place to give an account of the system, and to make suggestions in connexion with it, using as a basis the information contained in the Leaflet mentioned above.

The establishment of a society for the insurance of live stock may be brought about by mutual agreement, without registration, but this, in England, may be effected, if it is desired, through the Friendly Societies Act, 1896. The fact that such a society has been registered in this way does not form a guarantee of its solvency; the circumstance that it has to frame certain rules, in order to comply with the provisions of the Act, assists, however, in its good management, and provides a certain amount of useful control over its operations.

In drafting rules for the conduct of such a society, careful consideration of the following points is required: liability of the members, the extent of its working area, the amounts of compensation, the case of compensation

after compulsory slaughter, the employment of a veterinary surgeon, precautions to prevent the spread of disease, method of raising funds, and the investment of reserve funds.

In the case of registered societies, the liability of each member, in respect of amounts to be paid by it, is usually unlimited. In this instance, insurances are only taken out for comparatively small amounts, and large risks, such as valuable pedigree stock, are not accepted. In any case, it is desirable that the maximum amounts to be paid should be specified in the rules.

It seems best that the area covered by each society should be comparatively small, especially in thickly populated districts. In this way, the chance that all the members will be acquainted with one another is increased, and a useful check to fraud is supplied. Other considerations are that the duties of inspection, valuing and marking will not be so large as to be onerous, and that the responsible work, especially in connexion with administration, may be done by those who are willing to accept an honorary position. An objection to the confining of the work of any one society to a small area is that, in the event of a large mortality among the stock of its members, owing to an epidemic, it may not be possible to afford help when it is most needed. This contingency may be avoided by reducing the amount of compensation payable to a proportion consistent with the state of the funds, by a levy on the members, or by reinsurance. In relation to the West Indies, it is safe to say that serious epidemics among stock are comparatively rare, so that the circumstances just detailed are not likely to occur.

In the matter of compensation, as regards such animals as cows, the amount of this is often paid at the rate of three quarters of the full value, though a limit of £10 is sometimes made. Pigs are often paid for at the full value. The valuation of animals on which compensation may have to be paid is made either on the reception of a report of illness, or on registration under the society's rules. The latter would appear to be the better procedure, especially as the former method entails the risk of infection being carried by the members of the valuing committee, and the valuation of an animal on registration helps to prevent the exercise of certain forms of fraud. In many cases, where the animal is valued after it has fallen ill, it becomes the property of the society directly its value has been appraised, and its condition seen by the committee.

In the case of compulsory slaughter, where a certain sum is paid to the owner of the animal by the authority responsible for the order for its destruction, the society would only be liable for the difference if any, between the amount thus paid and that for which insurance was made. The existence of such an arrangement is specially beneficial, as it enables the society to insist upon the speedy notification of disease to the authority, where this is required, and the rules should be drawn up in such a way as to enable compensation to be refused, in the event of the lack of such notification.

The employment of a veterinary surgeon, in case of illness, is usually in the hands of each member of the society, and there is no limitation of his choice in the matter. It is the rule of some societies, however, to pay the fees of the surgeon, subject to permission for his employment being obtained from the committee of the society. It would probably be a convenient plan to arrange for treatment of the animals belonging to the members, in return for a fixed fee in each case. The precautions to be taken against infection have already been dealt with incidentally.

For raising funds, there is commonly an entrance fee, and a fixed annual subscription for each animal. The objection to this system is that the premiums paid are not proportionate to the value insured. A remedy may be found by valuing the animal on registration, and exacting a premium proportionate to its worth, and by annual revaluation. If this led to the accumulation of a large reserve fund, the scale of premiums could be rearranged so as to make them smaller. In the matter of reserve funds, the rules of the society should make it compulsory that money not immediately required, or that for meeting the ordinary, additive liabilities, shall be lodged to its credit in a savings, or other, bank.

In the West Indies, at first, any movements in this direction would be small in extent, and care would be required in order to ensure that the management was in the hands of reputable persons. It would seem most expedient that those who would be responsible for the custody and administration of funds should hold honorary positions in the society; the work could suitably be done by a clergyman or minister in the district. It would possibly be best, under the special conditions, for all animals that are reported to be in ill health to become the property of the society, for treatment and disposal as it may think fit; this would tend to ensure the absence of intentional neglect, and would protect the society against its results. In any case, the careful adoption of the system on a small scale would probably lead to its subsequent enlargement, with suitable modifications, and would help to ensure prosperity in the area of its operation.

IMPLEMENTAL TILLAGE FOR ST. VINCENT.

Agricultural conditions in St. Vincent have recently given rise to an interest in implemental tillage and, as a result of a desire, on the part of those concerned, to gain information in connexion with the matter, the Agricultural Instructor (Mr. G. Fraser) was sent to Antigua, where this form of cultivation has been employed on a fairly large scale for some time, in order that he may be in a position to give advice and instruction in the subject. Mr. Fraser's report has been duly made and published in the St. Vincent *Government Gazette*. Apart from its intrinsic interest, the circumstance of his visit has a value which it derives from the fact of its being an illustration of the ready provision of assistance to one colony by another, under the direction of the Department of Agriculture. It should be mentioned that, in forwarding the report, his Honour the Administrator of St. Vincent requested that, in the event of its being used in any way in the publications of the Department, expression should be made of the acknowledgement, on the part of the Government, of the courtesy of Mr. H. A. Tempany, the Superintendent of Agriculture of the Leeward Islands, and of those planters who gave assistance in the matter. The gist of Mr. Fraser's report is as follows:—

Mr. Fraser, who was accompanied by a labourer sent by Mr. G. R. Corea, left St. Vincent on August 2, and arrived in Antigua on August 4. On his arrival, Mr. Tempany obtained an interview with his Excellency the Acting Governor for him, to whom he stated the object of his visit, and who kindly offered to assist him in every possible way. Subsequently, Mr. Fraser was introduced to Mr. I. E. Dyett and Mr. Walrond of Fitches Creek Estate, who promised to give him every facility for gaining a practical knowledge of the implements, their use and their working.

In preparing land for cane or for cotton, it is first close-ploughed, and then harrowed once or twice in different directions. After the land has been lined off, the banks are thrown up by means of a single mould-board plough which runs along each side of the line in opposite ways. The furrows are cleaned out and the bank raised by using a double mould-board plough, called a 'middle burster'; then the banks are shaped by an 'Orleans' disc cultivator, and if they are still uneven, a 'gee-whiz' cultivator is run along the sides of them.

For cane-planting a shallow trench is run along the top of the banks by means of a double mould-board plough, the canes being subsequently covered by a plough or cultivator; another method is to harrow over the banks after the cane has been planted in the furrow. In planting cotton, a Georgia single stock plough is run along the top of the banks, and is followed by an Avery Union corn and cotton seed drill.

The first weeding is done with the Planet Junior horse hoe, followed by an 'orchard' harrow: subsequent weedings are performed in the same way, with the addition that the sides of the banks are cleaned with a 'gee-whiz' cultivator. Weeding by hand has still to be done along the track line of the plants. Banks which become broken down badly are moulded up by means of an 'Orleans' disc cultivator. In dry weather, when the soil becomes hard, it is broken up by means of a 'comet' cultivator.

Corn is planted like cotton, but green dressings are usually sown with it on each side of the banks, and only one cultivation is given, that is by means of the hoe. After the corn has been reaped, the green dressings and the corn stalks are thrown into the furrow and ploughed in. After this, the land is again prepared for cane.

For drainage purposes in Antigua, cross drains every 20 or 30 feet are run with a double mould-board plough, after the land has been prepared. The main drains are made by hand labour, and have to be constantly cleaned.

The implements employed are described below. Before they are used, it is necessary to break up the land by means of a plough. Any type of light iron plough with a high beam, such as the 'South African Eagle' plough, made by Messrs. Ransomes, Sons and Jefferies, is suitable.

No. 2 U-BAR STEEL FRAME LEVER HARROW.—This is a harrow with bars made of U-shaped steel to which are attached 60 teeth, 30 on each section. The teeth are adjusted to the slant required, whether for releasing trash, for pulverizing the soil, or for smoothing, by means of levers. The length of the teeth is also adjustable. The machine is drawn by two mules or oxen.

No. 2 CUBAN DOUBLE MOULD-BOARD FLUKE.—This is made by Messrs. B. F. Avery and Sons, Louisville, Kentucky, and is specially used for cane and cotton banking and trench cleaning. The width of the mould-board can be regulated to give the distance required between the banks. It is drawn by two oxen.

No. 1 SINGLE PLOUGH STOCK.—This is a light implement which is drawn by one mule, and is used for opening a furrow on the top of the banks.

ORLEANS DISC CULTIVATOR.—This is used to complete the banking of lands for cane, cotton, etc., and for moulding up the young plants. It is also useful for the cultivation of ratoon canes before they have become 3 feet high. The implement has 3 discs attached to each lever, which can be adjusted at different angles, and both low and high axles are supplied to suit the height of the plants. It is drawn by two mules.

COMET CULTIVATOR.—This is used for breaking up hard soil and for moulding up plants. Like the one just mentioned it straddles the banks, but has shovels in the place of discs. It is specially suited for hillside work and for rough ground, as it possesses an arrangement of springs to minimize shocks, and has not to carry the driver. It requires two mules.

No. 9 PLANET JUNIOR HORSE HOE.—This is very useful for weeding purposes, when the growth is not heavy; though it can be readily adjusted to carry out several different operations. It is drawn by one mule.

No. G 'ORCHARD' HARROW, 14-TOOTH.—In this, the width and depth of the work can be regulated. It is chiefly used for cleaning and pulverizing the soil after it has been worked by the other cultivators above mentioned. It requires one mule.

'GEE-WHIZ' CULTIVATOR.—This is a combination spring tooth, side, and V-harrow, and is adapted to almost any kind of cultivation. It is drawn by one mule.

No. 16 AVERY'S UNION CORN DRILL.—This is very useful for sowing cotton seed and Indian corn. With the exception of the handles, it is made entirely of steel and iron; it is strong, and is drawn by one mule walking on the top of the bank.

Mr. Fraser left Antigua on August 25. He concludes his report by expressing his indebtedness to those in Antigua who so kindly did everything possible to help him to gain the necessary information and experience, particularly Mr. H. A. Tempany, B.Sc., Mr. I. E. Dyett and Mr. L. C. Walrond, of Fitches Creek Estate, and Mr. Sidney Smith of Blubber Valley and Yorkes Estate.

WEST INDIAN FRUIT.

GROUND NUT EXPERIMENTS IN MONTSERRAT.

In the last issue of the *Agricultural News*, an account was given of recent experiments with ground nuts in Dominica and St. Kitts. The following are the results of somewhat similar experiments which have been conducted in Montserrat during the last season. The area of each of the plots was as follows: Carolina Running and Spanish, $\frac{1}{20}$-acre; Gambia, $\frac{1}{60}$-acre; local variety $\frac{1}{26}$-acre:—

Variety.	Unlimed plot. lb. per acre.	Limed plot. lb. per acre.
Carolina Running	2,320	2,740
Spanish	1,320	1,440
Gambia	1,740	2,340
Local variety	286	325

The whole section received a dressing of cotton seed meal at the rate of 600 lb. per acre.

The figures represent the actual weight of the nuts after they had been dried for one week in the sun; this is not the weight of the marketable nuts, as it was afterwards discovered that they continued to lose weight for some time after the records had been made. Calculations on the weight before and after completely drying would seem to show that a fairly true estimate of the actual returns may be obtained by deducting one quarter of the quantity given above, in each case.

As regards the different varieties, the tests are not truly comparative, as the Gambia was planted a fortnight later than the Carolina Running and the Spanish, and the local variety a fortnight later than the Gambia. This is an important consideration in view of the fungus disease (*Uredo arachadis*) which attacks the plants. There is little doubt that this disease shortens the life of the ground nut in Montserrat considerably, but it is noticed that, if old plants having the disease are not growing in the vicinity, it does not develop to a serious extent until the growth of the ground nut is fairly well advanced. This is probably the reason why the local variety gave such poor returns in the above trial, for it was to leeward of the other plots, and consequently the fungus attacked it early.

The time for reaching maturity was $3\frac{1}{2}$ months for the Spanish variety, and 4 months for the others.

In comparing the results of these trials with those of other seasons, it is to be observed that the returns of the imported American varieties have much improved; the quality of the nuts, however, leaves something to be desired. The shells of the Carolina Running still remain large, but the kernels do not fill them nearly so well as they did in the case of the pods which were first received for planting. The Spanish variety seems to have become reduced in size, and the pods are not as large as those which were first obtained.

It is useful to note that the pods of the Gambia and Spanish varieties adhere well to the stems, allowing the plants to be pulled out of the ground with the fruits still attached. On the other hand, those of the Carolina Running require to be dug, and the Buco hand cultivator has been found to be a very useful tool for this work.

In considering the results, it is probable that the improved yield is in a great measure due to favourable weather conditions.

NITRIFICATION IN SOILS AND IN SOLUTIONS.

In the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXI, No. 2, an account is given of the conclusions which have been reached in an investigation of the process by which nitrogen is made available in soils and in solutions (nitrification). From this it appears that investigations in this direction, in which solutions are used, do not give results that are immediately applicable in the case of soils.

(1) Many soils which can nitrify ammonium sulphate and cotton seed meal mixed with them, fail to nitrify ammonium sulphate and cotton seed meal when used as the inoculating material for solutions, such as those of Omelianski Wiley and Ashby.

(2) Nitrification is absent or very slight, in saturated soils.

(3) Nitrification in some soils proceeds as fast as ammonification, converting the ammonia to nitrate as fast as it is rendered available by the ammonifying organisms.

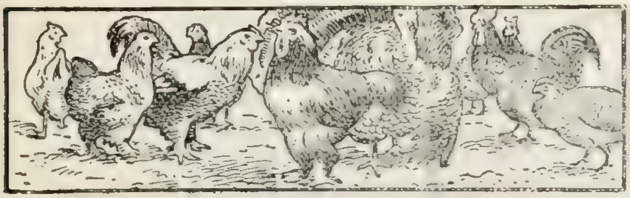
(4) Nitrification in extract of soil is, in some instances, very slight as compared with nitrification in the soil itself.

(5) Nitrification in soils increases in intensity with the amount of inoculating material used.

(6) Some nitrifying soils do not nitrify when placed in solutions, even though a very large amount of inoculating material is used.

(7) Nitrifying organisms from sewer beds nitrified better in solutions than in soils.

(8) Tests in solutions are not adequate to indicate the nitrifying vigour of a soil.



POULTRY NOTES.

BREEDING AND CARE OF FOWLS.

The *Experimental Farms Reports* of the Dominion of Canada for the year ending March 31, 1909, has been recently issued as an appendix to the Report of the Minister of Agriculture. In the section which deals with the work of the Poultry Manager, some mistaken impressions of poultry keepers are corrected in a useful manner. The points which have special reference to conditions in the West Indies are given here:—

An erroneous impression on the part of many poultry keepers is, that having secured a prolific egg-laying strain of fowl, no effort is necessary to perpetuate the excellence of that strain. Experience has clearly shown that continued careful and skilled breeding is necessary to retain or develop prolific egg-laying characteristics. The term prolific is not used as referring to those phenomenal egg-layers with records of 200 to 210 eggs per year each—rare specimens of which are sometimes exploited—but to refer to hens, from which, by selection, we may obtain an average of from 100 to 120 eggs each per year. It may be claimed that many fowls, under ordinary conditions, lay that number of eggs. But the experience gained in many years, by breeding from layers selected by trap-nest tests, does not verify that assertion. There is reason to believe that, in numerous cases, the number of eggs laid by a specially good hen or two in a pen have been noted and the laying qualities of the remainder have been rated as of the same exceptional merit.

The remark may be frequently heard, from an enthusiastic but inexperienced poultryman, 'I have a hen which I believe lays an egg every day.' But what about the merits of the other fowls in the same pen? The impression conveyed is that all the other inmates of the pen are equally extraordinary layers. The trap-nest, with its mechanically correct record, is the surest means of proving which are the best, the worst and the indifferent layers. Only fowls of one of the varieties which have been shown to be good layers of large eggs, as well as of correct market type, should be selected, and these should be carefully mated before being placed in the breeding pen. It is of paramount importance that the male bird, mated with the selected layers, should also come from a family of proved prolific layers, as otherwise there might be retrograde rather than progressive influence. Careless or haphazard mating of old, young or untried birds is not likely to result in success.

In establishing a strain of prolific layers of large eggs—in combination with good market type—the following breeds may be suggested, viz.: for eggs and flesh, select one of the best utility types, such as Barred Plymouth Rocks, White Wyandottes, or Buff Orpingtons. For eggs only, a choice may be made of any of the following: White Leghorns, Black Minorcas, Andalusians or Black Hamburgs. A rule important to observers is that none but the best layers among the varieties named should be chosen. Where it is possible to make a selection by trap-nests, such fowls should be preferred. Too much care cannot be taken in selecting a cock bird to head the breeding-pen. The mistake is frequently made of purchasing a cock bird derived from a family of inferior layers to mate with hens of proved merit. Such action is surely detrimental. Unless it is absolutely unavoidable, pullets should not be used to breed from. They are really undeveloped fowls, and no such immature specimen should be found in a breeding-pen.

A second erroneous impression—especially common among the farming community—is that any sort of building is good enough for the housing of poultry. As a result of this impression, poultry houses dilapidated, lice-infested, ill-ventilated, unclean and improperly furnished are sometimes met with. It is hardly necessary to remark that in such cases the birds are unprofitable. Poultry houses are now made which are easy and cheap of construction, while of the most approved patterns.

THE ROOT DISEASE OF SUGAR-CANE.

At the next general meeting of the Agricultural and Commercial Society, Antigua, to be held on January 14, 1910, it is intended that the chief subject for discussion shall be Root Disease of Sugar-cane in Antigua, and the best methods of suppressing it. Previous to this meeting, a circular containing a series of questions has been issued to sugar planters in the island, by the Superintendent of Agriculture for the Leeward Islands (Mr. H. A. Tempany, B.Sc.), with a request for answers, in order that information which will form a useful basis for discussion may be available at the meeting. As these questions are of more than local interest, they are given below :—

(1) Have you observed that root disease of sugar-cane is prevalent on the estate under your charge. If so, to what extent?

(2) Do you consider that it has increased in extent during the past few years?

(3) Which do you consider most attacked, plants or ratoons?

(4) Have you noticed that the disease is more prevalent on any one type of soil?

(5) Have you noticed whether any form of treatment of the soil or otherwise has resulted in either an increase or decrease of the disease?

(6) Have you noticed whether any particular varieties of cane are attacked worse than others? If so, what are they?

(7) Have you noticed whether any particular varieties are attacked less than others? If so, what are they?

(8) If you have not definitely recognized root disease of sugar-cane, have you observed any appearance of retarded or insufficient development of canes under circumstances which would appear favourable to growth?

(9) Have you noticed any decrease in the prevalence of root disease as a result of rotations of (a) cotton, (b) green dressings, (c) provision crops, (d) fallow?

(10) Have you noticed any increased spread of the disease as a result of the use of pen manure containing material infected with the disease?

(11) Do you consider that root disease of sugar-cane at the present time is a serious menace to the sugar industry of the island?

(12) Are there any other facts which you have noticed, which have a bearing on the question?

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 20, with reference to the sales of West Indian Sea Island cotton :—

About 40 bales Barbados Sea Island cotton have been sold since our last report, chiefly at 18*d.*, with one superior lot at 19*d.*

The market is firm for Sea Island descriptions, owing to the high price ruling for Egyptian; had it not been for the firmness of the latter growth, we think Sea Islands would have ruled rather easier.

Sea Islands are undoubtedly relatively cheaper, but there are very few consumers who can substitute them for the best Egyptian.

The report of Messrs. Wolstenholme and Holland for December 6, was as follows:—

Since our last report, about 20 bales of Barbados Sea Island cotton have been sold at 17½*d.*, and 10 bales Nevis at 16½*d.*

Sea Island cotton is rather easier in price in Charleston and Savannah. The best Floridas can be obtained at about 15½*d.* to 16*d.*; on the other hand, Egyptian cotton has risen very considerably, which makes all descriptions of Sea Islands look comparatively reasonable.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 18, is as follows:—

The sales this week consisted of 250 bales of cotton, the poorest in stock, at 30c., for England, and a crop lot of 15 bales Extra Extra at 52c., for France. Otherwise the market was quiet and unchanged, with factors continuing to hold for their prices, viz.: Fine 33c., Fully Fine 35c., Extra Fine 37c. But as there is no inquiry in the market at these prices, to effect sales they wlll probably in time have to lower their views.

THE COTTON INDUSTRY OF UGANDA.

The following account of the state of the cotton industry in Uganda is abstracted from a report by the late Governor (Sir H. Hesketh Bell, K.C.M.G.), which has been issued as *Colonial Reports—Miscellaneous*, No. 62:—

The steady growth of the industry is clearly shown by the table of exports given below.

If the large quantity of unginned cotton that has been exported from Uganda to be treated in British East Africa had been ginned locally, the figures showing the value of the Protectorate's exports would be considerably increased.

			£
1904-5,	9 tons ginned cotton	worth	236
1905-6,	43 tons ginned cotton	,,	1,089
1906-7,	175 tons ginned cotton	,,	6,292
1907-8,	645 tons ginned and 213 tons unginned cotton	,,	49,690
1908-9,	512 tons ginned and 640 tons unginned cotton	,,	41,223

Up to the middle of 1907, there seemed to be no cause for anything but congratulation as regards the progress of the cotton industry in Uganda. It soon became apparent, however, that all was not as it should be. On August 2, 1907, the Chairman of the British Cotton Growing Association addressed a letter to the Colonial Office drawing attention to the possibility of serious deterioration in the quality of Uganda cotton. He pointed out that the depreciation in the value of Indian cotton had been mainly due to the mixture of varieties, and doubted whether adequate measures were being taken in Uganda to guard against similar results. On my return to Uganda in November 1907, I made careful enquiry into the points raised by the Chairman of the British Cotton Growing Association, and found that the eventuality to which he had drawn attention was already declaring itself. Competition among local buyers had become so keen that almost any kind or quality of raw cotton was being purchased. The natives found that dirty, and even badly stained, produce was worth money, and their natural indolence speedily took advantage of the fact. Unsatisfactory reports began to be received from Manchester as to the quality of the cotton that was coming from Uganda, and prices began to fall.

But the most serious charge that began to be made against Uganda cotton was the reproach of 'mixture'. The distribution of all the different varieties of seed that had marked the early and experimental stages of the industry was beginning to have effect. The cotton that was coming to market was found to be of all sorts and descriptions. Bales of ginned lint contained American, Egyptian, Peruvian and various other varieties all hopelessly mixed up. Short staples and long staples were being ginned together in a reckless manner, and it was evident that the causes which were responsible for the depreciated value of Indian-grown cotton were beginning to have full play in Uganda. It soon became apparent that the industry which had been marked by such phenomenal progress was in danger of a serious check, if not of ruin.

In November 1907, as a result of careful enquiry into the situation, I invited all the principal parties who were locally interested in cotton to meet me in conference, so that reasonable measures might be devised for the protection of the industry. It was unanimously agreed that the situation demanded strong and immediate action. I venture here to

insert some paragraphs from the despatch which I addressed to the Earl of Elgin on December 30, 1907, in which my recommendations were conveyed. [Here the abstract follows.]

The views thus expressed met with the approval of the Earl of Elgin, and steps were at once taken to carry them out. An Ordinance, entitled 'The Uganda Cotton Ordinance, 1908', was enacted in March, under which the Governor was given power to make Rules for maintaining and improving the quality of cotton in the Protectorate.

Thanks to the energy shown by the various District Officers, by the Officer who has been temporarily in charge of the Cotton Department, and by the Cotton Inspector, the main objects of the Rules made under the Ordinance of 1908 have been effected to a degree which we hardly hoped for. The chiefs have given such loyal assistance in the eradication of all undesirable kinds of cotton that it is now comparatively difficult to find a single plant that is not 'American Upland'.

Insect pests are beginning to present a serious menace to the cotton industry, and Rule 4 has been specially framed to meet the situation. It has been abundantly proved that old cotton plants, if allowed to remain more than one year in the ground, become the host of vast numbers of noxious insects. It has therefore been ordered that all cotton plants more than 12 months old shall be destroyed by their owners.

It was only to be expected that the interference which the Administration considered it necessary to exercise in regard to the conditions under which cotton was alone to be grown would have some restrictive effect on the output, and it was feared at one time that the 1908-9 crop would show a distressing reduction, as compared with that of the preceding year. The ruthless uprooting of all cotton plants that were not of the authorized variety would naturally entail the loss of a lot of lint which would otherwise come to market, while the stringent regulations governing the issue of seed might be expected to restrict the area of new cultivations. I am thankful to be able to state that the check was almost trifling. The desire to grow cotton, on the part of the natives, is already so firmly established in the country that the stringent regulations appear to have had no discouraging effect. The exports of cotton during the year 1908-9 amounted to over 500 tons of ginned, and about 650 tons of unginned cotton, and it is expected that the crop of the coming season will show a considerable increase over those figures.

ARBOR DAY IN ANTIGUA.

Arbor Day was again celebrated in town and country in 1909, as has been the custom in former years. In St. John's and the country districts, with the exception of St. Paul's, the ceremony as usual took place on November 9; in St. Paul's parish, for reasons which appear below, the celebration was held on Saturday November 6.

In St. John's the celebration took place at 8.15 a.m. when, immediately after the conclusion of the inspection of the local forces, his Excellency W. Douglas Young, C.M.G., planted a white-wood tree in the Victoria Park, on the site where the old bandstand formerly stood, the representatives of the various bodies taking part and the general public having previously assembled at this point.

After planting the tree, his Excellency made a few brief remarks relative to the day and its objects; the representatives of the various bodies concerned then dispersed to their respective stations and planted trees.

In St. James, the celebration took place at 9 a.m. when, amid a large gathering of people, a number of mahogany trees were planted on the east side of the path leading from the south gate of the churchyard to the Church. The organization of the celebration was carried out by the Rev. T. Streater.

In St. Luke's district, 6 shade trees were distributed by Mr. Ernest Dew, and were planted by peasants in different parts of it.

In addition to all these, a number of trees were planted by private residents in St. John's on Arbor Day.

In St. George's parish four mahogany and two eucalyptus trees were planted by the school children at St. Mark's. Twelve eucalyptus trees were also planted on the lands of the Antigua Sugar Factory.

Arbor Day was celebrated in All Saints' parish on November 9, as usual. At 7.30 a.m., the church and school bells were rung, and the scholars, teachers and other parishioners assembled in the schoolroom at 8 a.m.

The prayers for the King and the Royal Family were read and the National Anthem sung, after which a short address on the objects of Arbor Day was given; then followed patriotic songs by the school children, and subsequently trees were planted.

In St. Philip's parish, 6 royal palms were planted opposite St. Philip's Church. At St. Stephen's, 3 royal palms and 3 cocoa-nuts were planted. In both cases the planting was done by the children of the elementary schools.

As the observation of Arbor Day had been in abeyance in St. Paul's parish for several years, it was thought desirable to mark its revival by a special celebration. For this purpose, it was decided to hold it on November 6, instead of on November 9, in order to permit of persons being present who might not otherwise have been able to do so. The celebration commenced at 4 o'clock in the afternoon, and, in addition to the acting Chairman, the Rev. R. H. Jones, and the representatives of the local bodies who joined in the planting, Major Ledeatt and a detachment of the Mounted Infantry of the Antigua Defence Force, Mr. Tempany (acting Chairman of the Central Committee), Mr. Martin, Inspector of Schools, and Mr. F. S. Bishop were present. The proceedings commenced with a short service in St. Paul's Church and, after a short address had been given, in the grounds of St. Paul's Rectory, on the objects of Arbor Day, trees were planted by the representatives of the districts and by some of the visitors. The arrangements for the celebration were carried out by the Rev. R. H. Jones who, on account of the indisposition of Mr. W. E. L. Odlum, acted as Chairman of the St. Paul's Committee.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados for Antigua by the S.S. 'Dahome', on the 5th instant, for the purpose of accompanying a small party of planters and others from Barbados, who are visiting Antigua in order to gain information concerning the equipment and working of the sugar factories in that island, and to enquire into the methods of implemental tillage employed there, as well as generally to promote the interchange of views between the agriculturists of the two colonies. Dr. Watts will also make visits, in connexion with agricultural matters, to such other islands as it may be possible, during the journey, and, in addition, will visit St. Kitts, probably returning to Barbados by the S.S. 'Oruro' on the 23rd instant.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. IX. SATURDAY, JANUARY 8, 1910. No. 201.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of this issue gives information concerning the mutual insurance of live stock, together with hints in connexion with the formation of societies for that purpose.

An interesting and instructive report on the subject of implemental tillage, especially in connexion with conditions in Antigua and St. Vincent, is abstracted on page 3.

In this number, on page 4, and in the last (No. 200) on page 404, accounts of recent experiments with ground nuts in Montserrat, and in Dominica and St. Kitts, respectively, are given.

Some errors that are often made in respect to poultry keeping are pointed out in an article on page 5.

An interesting account of the present state of the cotton industry in Uganda is given on page 6. Attention is drawn to the importance which is attached there to the avoidance of mixed cultivation of different varieties, and to the destruction of old cotton.

The Insect Notes in this issue form a summary of information in respect to the pests that came under the special notice of the Department in the year 1909. See page 10.

An account of remedial measures for fungoid pests of garden plants appears on page 11.

Medicinal Extracts from Plants.

The results of researches which were undertaken for the purpose of finding the reason why extracts from fresh plants have a different physiological action from those of dried plants have recently been presented to l'Académie de Médicine. The investigators have been able to demonstrate that many of the active principles, if not all, are associated in plants in a special way which gives rise to their particular physiological action. The result of the researches has been to establish the manufacture of plant products which have exactly the same medicinal action as the fresh extracts from the plants. An interesting example of such a product is 'Kolatine', obtained from the kola nut.

The Exploitation of Jequie Rubber.

The production of Jequié Maniçoba rubber (from *Manihot dichotoma*) is chiefly in the hands of the Jequié Rubber Syndicate, Ltd., which owns estates, in the district of Conquista, Bahia, Brazil, having an area of about 80,000 acres, 690 of which are at present planted in *Manihot dichotoma.* The number of trees in the cultivated acreage and cleared forest is said to be about 420,000; in addition to these, 400,000 matured trees and 500,000 saplings will probably be rendered accessible when the forest growth is cleared away. It is proposed to clear further, in the immediate future, 3,000 acres, on which trees to the number of 1,500,000 will be planted; in addition to this, there is a large area of forest where the rubber trees do not grow in large abundance. The syndicate is well capitalized.

According to the *India-Rubber Journal*, tree specimens of *Manihot dichotoma*, which have been recently received in London, gave a fair amount of latex. In addition, samples of the rubber were found to be first-class in quality, the purity comparing very favourably with rubber from plantations in the East.

Cotton Growing in Ceylon.

Progress Report No. XLVI (October 1909) of the Ceylon Agricultural Society states that the want of good seed has been one of the drawbacks in the encouragement of cotton cultivation in that island, and with a view to meeting it, the Society has ordered a large quantity of both Sea Island and Egyptian seed. Half a ton of selected Sea Island seed has been received from the British Cotton Growing Association. Local difficulties have arisen in the matter of ginning, but satisfactory arrangements are likely to be made, with the cooperation of the British Cotton Growing Association.

Encouraging reports in respect to cotton growing have been received from the Eastern Province; and, with the arrival of good seed, a fresh effort will be made to interest the northern cultivators in the industry. It appears that the conditions in the Jaffna Peninsula are particularly favourable, and that cotton might well take a place there in the rotation of crops. One of the greatest drawbacks to the industry at present is that there are no local firms who purchase cotton.

A New Velvet Bean.

According to the *Philippine Agricultural News*, No. 1, unsatisfactory results have been obtained in the Philippines, so far, with trials of the velvet bean. The Philippine Bureau of Agriculture has, however, discovered, and brought into cultivation, a wild and hitherto undescribed velvet bean, *Mucuna pruriens*, var. *Lyone*. In the experimental cultivation it has reached the third generation, and various improvements are taking place, among these being the reduction of the wood in the main stem, and increasing palatability of the seed. It is stated that the plant is superior to the velvet bean (*Mucuna pruriens*, var. *utilis*).

Broom Corn in Antigua.

The annual report on the Botanic Station and Experiment Plots, Antigua, for the year ending March 1909, gives information concerning experiments that were conducted with broom corn during that time. Two $\frac{1}{10}$-acre plots were planted, one on June 10 and the other on November 4. These were harvested on September 25 and February 18, respectively. The seeds on one-half of the first plot were sown like those of guinea corn, that is, on 4-foot banks, the plants being 2 feet apart, with five to eight plants in a hole; in the other half, the plants were 9 inches apart, with five to eight plants in the hole, in rows 18 inches apart. The returns from these halves of the plot were 53 lb. and 60 lb. of dried broom corn, respectively.

In the second $\frac{1}{10}$-acre plot, the plants were 6 inches apart in rows 18 inches distant from one another. From this plot 115 lb. of dried broom corn was obtained.

A consideration of these results shows that the yields obtained from the closer planting are not much larger than those where it was wider. A finer corn, however, is obtained from the closer planting, so that it is suggested that the distance 18 inches by 9 inches is the most suitable one for adoption.

The Effects of Carbonates upon Nitrification.

It is well understood that by nitrification is meant the formation of nitrates from organic nitrogen in the soil, the first products being ammonium compounds, then nitrites, and finally nitrates, the whole process having for its cause the action of bacteria. Stated shortly, the advantages of nitrification are as follows: (1) nitrogen available to plants is formed, (2) nitrogen is prevented from being lost through decomposition, (3) nitrogen which exists in the soil in a state useless for plants is made useful for them. It is obvious that, as this action is due to micro-organisms, the best way to render it as efficient as possible will be to stimulate the action of those organisms. It has been found that the rate of nitrification is dependent on the temperature, the supply of oxygen, the supply of moisture, the presence of carbonates, and the presence or absence of an excess of organic matter.

In connexion with the fourth of these, namely the presence of carbonates, exhaustive investigations have recently been undertaken at the Georgia Experiment Station. The result has been to show, firstly, that nitrification is dependent on the amount of carbonate present; secondly, that of the carbonates magnesium carbonate has the greatest effect in stimulating the growth and action of nitrifying organsims; thirdly, that the nitrifying organisms of the soil do not depend to any appreciable extent on the carbon dioxide of the air for their supply of carbon.

The Chinese Sugar Industry.

In former years, Swatow was the chief centre of the Chinese sugar-manufacturing industry, and large quantities of the product were exported to England in sailing vessels. The demand is now, however, confined to ports on the Yangtze-kiang, where the crude sugar is still preferred to the refined article. The decrease in production is shown by the fact that in 1899, the export of sugar from Swatow was more than 111,000 tons, while in 1908, it was only a little over 48,000 tons.

There are no large estates in these districts, but each farmer has a small amount of cane which he cultivates in the old way that is indigenous to the country. The result has been that, in spite of the fertility of the soil and the cheapness of the labour, the product, (according to the *Monthly Trade and Consular Reports*) has been displaced by that of the Hong Kong refineries, which deal with sugar produced on modern lines in the Dutch colonies.

Forestry in Trinidad and Tobago.

The annual report of the Forest Officer for Trinidad and Tobago, for 1908-9, shows that the work of demarcation done during that year in Trinidad completes the southern boundary of the forest reserve, with the exception of a length of about 22½ miles. As the boundary line, for the greater part, is at an elevation of 1,000 feet, it leaves out of the reserve the larger part of the valley where the best land is situated, while on the other hand it includes the large spurs where the land is generally poor. These large spurs are of great value as wind-breaks for the cultivation in the valley, and the forest reserve on them aids in the conservation of water.

In the plantations, the chief trees employed are cedar, Cyp (*Cordia* sp.) and mahogany. It is reported that cedar seedlings sown in 1907-8 averaged 12 to 15 inches in height, at the end of a year, while that of some was over 3 feet. With reference to record work, several plans of the reserve have been prepared on a small scale for field use with the boundary records, and will be lithographed.

The returns of the revenue for the year show that this was £1,609, which is an increase of £80 on that of last year. It is considered unlikely that any great increase in revenue will take place, since large areas of forest lands are being sold annually and rendered accessible by new roads, owing to the fact that timber is sold from these at lower rates than those fixed for timber from Crown Lands.

INSECT NOTES.

INSECT PESTS IN 1909.

It has not been the custom to issue an annual report on insect pests in the West Indies, and on the entomological work of the Imperial Department of Agriculture. It may be of interest, however, briefly to summarize the more serious occurrences of pests during the past year.

OF SUGAR-CANE. No serious attacks of sugar-cane pests have been reported in the Lesser Antilles during the year, except the occurrence of the root borer (*Diaprepes abbreviatus*) over a comparatively small area in Barbados, which may be regarded as important. The district in which the root borer attack is being experienced has suffered severely from drought for several years, and planters seem to think that the present attack is more severe in consequence.

The attack first becomes apparent in the head row of the fields, seemingly without regard to the windward or leeward aspects. When it becomes obvious that the stool is attacked, the canes are already in a dying condition and beyond recovery. As has already been stated, the affected stools in the head rows die first, and those further in the fields later. The attack, in several instances, has begun on the side next to where cotton was grown last season. This may be accounted for by the fact that the adult weevil sometimes feeds on the leaves of cotton. The remedial measures which are being put into force include the digging out of the infested stools, and forking and liming the hole in order to kill any grubs that may have been left in the ground when the stools were taken out. The stumps which are removed are taken to a rocky spot in a pasture, and stacked or bedded. After each load has been thrown on to the stack, a dressing of lime is broadcasted over the surface. Many grubs will be carried with the stumps, but it is expected that ants, birds, lizards and toads will capture such a large proportion of them that very few, if any, will survive and get back to the same field to provide for another generation of root borers. Experiments with vaporite and carbon bisulphide have been planned, and will be carried out. An interesting and valuable paper on the root borer appeared in the *West Indian Bulletin*, Vol. IV, p. 37.

In British Guiana, the larger moth borer (*Castnia licus*) has again been reported. In 1904-5, this pest was stated to be doing damage at plantation Enmore, and it now appears to have spread to other estates in the vicinity. Many remedies have been tried, including several recommended by the Imperial Department of Agriculture, but none of them seem to have been entirely successful. The practice most generally adopted is that of catching the adult insect with nets. The adult is a large, day-flying moth, measuring 3 inches across the wings. The caterpillars tunnel lengthwise through the cane for some 24 to 30 inches above ground, and through the underground portions of the stool, so that, in addition to causing a direct loss of a large amount of sugar, the insect makes it impossible to grow ratoons.

OF COTTON. During the season 1908-9, the cotton worm (*Aletia argillacea*) was very abundant, and cotton-growers were obliged to use large quantities of Paris green. During the present season 1909-10, very little trouble has been experienced with this pest in any of the cotton-growing islands, and the expenditure for Paris green has been reduced to a minimum. No serious trouble seems to have been caused by the flower bud maggot or the leaf-blister mite.

OF LIMES. Scale insects continued to attack limes, but no severe outbreak has occurred during the year. The study of the natural enemies of scale insects has been carried on, large amounts of material having been collected and forwarded to the Head Office. From examination of this material, it has been found that parasitic fungi are abundant, and are probably very useful in keeping certain species (perhaps all) of sale insects in check. Insect parasites of scales are also present in several of the islands, and they assist as well in keeping this pest under control.

OF ORANGES. In 1907-8 and 1908-9, a small caterpillar was reported from one estate in Dominica as attacking oranges, and it was stated that the pest seemed likely to become seriously important. The insect has not made its appearance during the present season (1909-10), and it is to be hoped that its natural enemies have assumed control of it.

OF GUAVAS. It has been suggested that the fruit fly, or guava maggot, of Dominica attacks oranges as well as guavas. The maggots of this fly were found in guavas shipped to Bermuda, and were identified as *Anastrepha acidusa*. (See *Agricultural News*, Vol. VIII, p. 93.) In October 1908, the Curator of the Dominica Botanic Station forwarded to the Head Office a crate of oranges, guavas, and mangos, which were suspected of being infested by the fruit fly. From the guavas, a number of specimens of *Anastrepha*, probably *A. acidusa*, were reared, but none could be obtained from the oranges or from the mangos. Another crate of oranges forwarded in November gave the same results. The present situation is this: guavas are attacked by a fruit fly, *Anastrepha acidusa*, in Dominica. Oranges are often injured in such a way that they rot, and many are lost in this manner, but so far, no fruit fly has been proved to be the cause of the injury.

OF CACAO. During the past year, no reports have been received of serious insect attacks on cacao. A beetle appeared in St. Vincent, and caused a certain amount of injury to the leaves of young plants, but did not assume the aspect of a serious pest.

OF SWEET POTATOS. The scarabee, or jacobs, of the sweet potato (*Cryptorhynchus batatae*) has been a very serious pest in Barbados during the past season. A series of experiments that was carried out gave no definite results, and another one has been started, which will be completed during 1910.

OF CORN. Toward the end of 1908, it was reported from Nevis that the varieties of Sorghum which produce the grain in dense heads were attacked by the larva of a small moth which lives at this stage among the ripening grain. This is not an easy pest to control, for there is some difficulty in getting any arsenical poison a sufficient distance into the head of developing grains to kill the small caterpillar, and as the damage is done before the grain is ripe, nothing can be gained by cutting the crop early.

In addition to the Insect Notes which have appeared in each number of the *Agricultural News*, the following papers dealing with the insects in the West Indies have been issued during the year:—

The Aleyrodidae of Barbados, *West Indian Bulletin*, Vol. IX, p. 345.

Millions and Mosquitos, *West Indian Bulletin*, Vol. IX, p. 382.

The Flower Bud Maggot of Cotton, *West Indian Bulletin*, Vol. X, p. 1.

The Scarabee of the Sweet Potato, *West Indian Bulletin*, Vol. X, p. 180.

Millions and Mosquitos, Pamphlet Series, No. 55.

Insect Pests of Cacao, Pamphlet Series, No. 58.

FUNGUS NOTES.

SOME FUNGOID DISEASES OF GARDEN PLANTS.

It is hoped that the following general remarks, on the methods of treating some of the diseases of garden plants, may prove of value to those who are interested in the cultivation of flowering plants, palms and other ornamental plants.

All fungoid diseases of garden plants may be classified under the three following heads :—

1. Root diseases.
2. Leaf and green stem diseases.
3. Diseases of hard woody stems.

Each of these classes of disease has its own general methods of treatment.

ROOT DISEASES. The external symptoms of root disease usually bear a close resemblance to those shown when a plant is suffering from drought. If the disease spreads slowly, the lower leaves are seen to wilt, dry up at their edges, and finally fall off; gradually more and more of the leaves fall in this way, until none are left, and the plant is dead. If, however, the disease spreads quickly, the symptoms are somewhat different. One morning it may be observed that all the leaves of the plant look soft and limp, as if it had not been watered. On the next day, some of the lower leaves are beginning to dry up, and all of them are considerably wilted; by the next after, the plant is dead. It is a simple matter to determine whether the plant is really suffering from drought or from a root disease; for if the wilting is due to drought, the plant will recover on being watered, but if the roots are diseased, watering will be without effect. On pulling up a plant that has died of a root disease, the roots are often seen to be covered with a fine white web, which is the mycelium, or vegetative portion, of the fungus causing it. This web will spread in the soil from the diseased plant to its healthy neighbours, but there will be no signs of this until the formerly healthy plants are themselves so badly attacked that nothing can be done to save them.

In nearly all the West Indian islands, a particularly destructive root fungus occurs, which destroys Aroids, Antirrhinums, Tomatos and several other plants.

When a root disease is seen to have attacked one plant in a bed, that plant should be immediately taken up and burnt, and the soil round it carefully dressed with lime at the rate of ½-lb. to the square foot, a little lime should also be sprinkled round the roots of neighbouring plants. If any of these last show signs of disease, they should be at once removed and burnt, and the soil again treated with lime. When a bed becomes thoroughly infected with a root fungus, the safest method of getting rid of the latter is to remove and burn all the plants in the bed, dress the whole bed with lime at the rate of ½-lb. to the square foot, and allow it to remain empty for about two months before replanting. Even then, it is advisable to put into the bed plants different from those which were growing there before.

If a group of plants in a hedge is seen to have died from the effects of a root trouble, all the plants should be taken up and burnt, and the whole spot surrounded with a trench about 18 inches deep and 2 feet wide. This trench should include one or two healthy plants at either end of the diseased patch. The soil from the trench should be thrown into the diseased area. This area should then be treated with lime as above, and, after six months, fresh plants might be planted.

LEAF AND GREEN STEM DISEASES. These parts of plants are often affected with spots of various kinds, rusts, and mildew, all of which are due to different fungi. Examples of these are: Canna leaf rust, due to a fungus, *Uredo cannae*, which appears as small orange-coloured spots on the leaves; leaf disease of palms, due to *Graphiola phoenicis*, which forms small, black, cylindrical, reproductive bodies on both sides of the leaves; rose and grape-vine mildews, which give the leaves and tips of the branches a silvery white appearance, due to the presence of a white fungus mycelium, which eventually kills the attacked portions, and which may do very considerable damage.

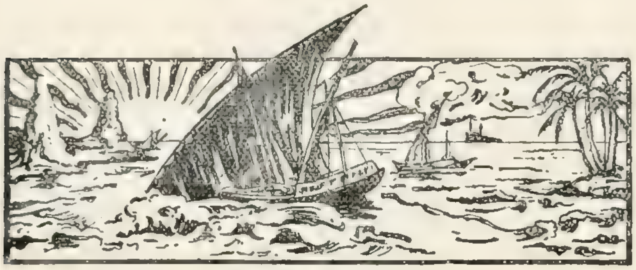
In the case of rusts and leaf spots, and the palm-leaf disease, the plants may be sprayed with a solution of potassium sulphide (liver of sulphur), made by dissolving ½-lb. of this substance in a quart of hot water, and then making the volume up with water to 2½ gallons. If preferred, a solution of potassium permanganate, or Condy's fluid, may be used as a spray; the solution should be of a light rose colour. Before applying the spray, it would be advisable to remove all badly diseased or dying leaves, and to collect all fallen leaves and burn them.

In the case of mildews, the diseased parts should be cut off and burnt, and all fallen leaves swept up with care and destroyed. The healthy parts of the plants should then be carefully dusted with a mixture of lime and flowers of sulphur. To make this, two parts by volume of flowers of sulphur should be mixed with one part of fine, air-slaked lime. The mixture may be applied by shaking it through a coarse muslin bag. It is advisable to do this when the plants are a little wet.

Seedlings that are being grown in boxes are often affected with a disease known as 'damping off', especially if the soil in the box is kept a little too moist. This is due to a fungus which spreads along the surface of the soil and attacks the seedlings at the level of the ground, causing them to wilt, fall over, and finally dry up. To prevent this, the dead seedlings should be taken out, and the remainder sprayed with a solution of liver of sulphur, made in the manner described above.

DISEASES OF WOODY STEMS. Many different forms of fungi can attack the bark and wood of plants, forming cankered areas, splits in the bark, hardened, darkened patches in the bark, or decay of the wood. Their fructifications may be of almost any shape and colour: black, red, yellow and brown are the commonest. Often, they look like black crusts or are very minute and require a hand lens before they can be clearly made out. But though the fructifications are often small and inconspicuous, the effects of the disease upon the host plant are, unfortunately, usually only too obvious. The only means of preventing the spread of this form of disease is by removing the diseased portions with a sharp knife, taking care to excise at the same time some of the apparently healthy tissue surrounding them, and afterwards to cover the wounds with tar.

In this short sketch, no attempt has been made to deal with two other important sources of disease, namely insects and physiological causes, such as unsuitable soil, or climate, too much or too little sunshine, and the like. Even the causes actually dealt with have been treated very shortly, but it is hoped that enough has been said to afford assistance to those interested in the methods of dealing with the fungoid diseases of garden plants.



GLEANINGS.

The amount of cacao exported from Trinidad during November last was 4,112,711 ℔. The total shipments from January 1 to the end of November, 1909, were 45,480,098 ℔. In 1908, they were 39,790,047 ℔. for the same period.

We have to acknowledge the receipt, from Messrs. Sandbach, Parker & Co., Georgetown, Demerara, of a map of the colony, together with useful statistical information in connexion with the latter.

The number of pine-apples exported from the Azores to London and Hamburg during 1908 was 1,155,888. In 1907 and 1906 the numbers were 1,306,658 and 1,281,487, respectively. The average price received for each fruit was 1*s*. 5*d*. (*Diplomatic and Consular Reports*, No. 4,239 Annual Series.)

Statistics show that, during 1908, there was an increase of 8·3 per cent. in the number of mills engaged in the production of lumber in the United States. At the same time, there was a decrease of 7,031,785,000 feet, or 17·5 per cent., in the total quantity of the output. The largest manufacture of lumber takes place in the State of Washington.

B. Remmers and Sons, of the Bourse, Philadelphia, U.S.A., announce that they have made a special study of the requirements of machines for making starch from the cassava and yucca roots, and that they can supply apparatus for the purpose. This includes root-washers, graters, re-grinders, and starch-refining centrifugals.

From a trade paper published in the United States, it is gathered that conditions in the broom corn market there, during November last, were steady, with a tendency to upward prices. In most parts of the Western territory, prices were higher than they had ever been before, so that growers are greatly encouraged, and will probably largely increase their acreage in 1910.

The interest that is being taken in the production of new and useful varieties of plants was recently illustrated by Professor R. Biffen at a meeting of the Cambridge and Isle of Ely Chamber of Agriculture. He stated that, in the effort to improve British barley, 250 distinct types had been experimented with by the University and Agricultural Department, including varieties from such distant places as China, Tibet, Australia and California. The aim of the experiments was to obtain a barley which should combine good cropping capacity, quality, and stiffness of the straw. So far, the first two characteristics had been combined, but the third had still to be obtained.

A report that has just been issued by the Italian Secretary of Agriculture shows that, in connexion with reafforestation, 122,000 acres of Government land has been planted in trees, of which 69,000 acres was planted in 1907 alone. The amount spent in this connexion during that year was about £400,000, and there now remains only about 36,000 acres of Government land to be planted.

A communication received from the Colonial Secretary of Grenada states that the certificates awarded to Messrs. J. T. Gairy and C. A. O. Phillips, who were successful in passing the Intermediate Examination in Practical Agriculture held there in November, were publicly presented to them by his Excellency the Governor at a meeting of the Legislative Council on the 17th December last.

The *Hawaiian Planters' Monthly* for October 1909 gives a recipe for stencil ink suitable for marking sugar-bags. It is made by dissolving 1 ℔ of glue in 1 gallon of hot water, and then stirring in 1 ℔. of lamp black. This makes a semi-solid stock, which may be diluted for use with a suitable quantity of hot water. The ink made in this way is cheap, dries very quickly, is practically indelible, and will not smear.

The report on the Botanic Station and Experiment Plots in Antigua, for the month of November, shows that the following plants, seeds, etc., were sent out during the month: cane plants 19,000, sweet potato cuttings 4,330, limes 2,900, onions 2,200, hay-grass (*Andropogon caricosus*) 600, cocoa-nuts 565, mahogany 104, shade trees 55, royal palms 45, eucalyptus 25, grafted mangos 6, miscellaneous economic plants 36, decorative plants 11.

The average output of olive oil from Asia Minor, including the chief neighbouring islands is about 16½ million gallons a year. In very good years, this quantity increases to about 25½ million gallons. Usually, not more than 20 to 25 per cent. of oil is exported; the best qualities go to France and Italy. The crop of 1909 appears to have been a failure in almost all olive-producing countries, and the yield from the Levant is not expected to exceed one-half of an average production. (*Journal of the British Chamber of Commerce*, Smyrna, April 1909.)

The *West India Committee Circular* for December 7, 1909, states that Lord Balfour of Burleigh, Sir Daniel Morris, and Mr. H. R. Cowell, with Mr. R. H. Mc Carthy, their technical adviser, will leave in the S.S. 'Oceanic' on the 16th instant for New York, on their way to Jamaica, where they expect to arrive in the R.M.S. 'Clyde' on January 27, and to meet the Canadian members of the Royal Commission, the Hon. W. S. Fielding and the Hon. William Paterson. After hearing evidence in Jamaica, they will proceed to Barbados in the R.M.S. 'Berbice', arriving there on February 14.

At the close of the International Congress of Tropical Agriculture and Colonial development, which was held in Paris in 1905, an International Association was founded, having for its principal object the organization of such Congresses in the future. It is now proposed by the International Association to hold a second Congress at Brussels in May 1910. The local arrangements at Brussels will be made in co-operation with the Belgian Association for the study of Tropical Agriculture; the International Botanical Congress will also meet at Brussels at the same time, and will take part in the proceedings.

STUDENTS' CORNER.

JANUARY.

FIRST PERIOD.

Seasonal Notes.

Now that cotton-picking is in progress, a good opportunity is afforded for studying the fruit and seeds of the plant, and the lint which is yielded by it. Collect a number of bolls, at various stages of opening, and compare them with the unopened bolls that you have examined already. In connexion with the development of the bolls, what action has the cotton flower bud maggot, which causes the serious reduction in yield that follows attacks by this pest? Find out whether the lint grows out from the fruit-covering or from the seeds, and compare its development with that of the pulp in an orange. In young, unopened bolls, the lint contains liquid matter. How is this withdrawn when the boll ripens, and what effect has this withdrawal in connexion with a useful, characteristic property of the lint? Study the effect of disease on the bolls, cutting them through in order to find out what, if anything, is happening to the lint. (See *Agricultural News*, Vol. VIII, p. 290 and references there given.) Distinguish between fungoid and bacterial diseases of cotton. It often happens that cotton plants suddenly commence to drop bolls in large numbers, while the reason for the circumstance cannot be traced to the action of any definite pest. State broadly how a cause may be assigned for this boll-dropping.

With reference to the yield of lint, comparisons should be made in the matter of the amounts that are obtained from different pickings. Does the first or subsequent pickings give the largest amount? Is there any difference in the quality of the product from different pickings? The amounts of lint from the different fields should be carefully recorded, and the differences in quality, if very marked, should be noted. These facts should be brought into relation with the history and state of the soil and the crops in the fields; in this way, useful information will be obtained with respect to the following points, among others: the best soils for cotton; the effects of cultivation and the use of the different manures; the importance of good drainage; the necessity for the removal of old cotton plants, after picking; the results from the use of different strains of seed (where these have been employed), as regards yield, quality, and resistance to disease; the relation between yield of lint and the extent to which attack by diseases and pests has taken place.

It is convenient to draw attention here to the way in which what has been stated in the last paragraph illustrates the necessity for constant observation and recording of results, if the observer is to be put into possession of facts that are really useful. If observation has been neglected at almost any stage, or if the results have been imperfectly recorded, their proper interpretation may be rendered impossible, or at least, made incomplete. It must not be thought that work of this kind can only be carried out with such a crop as cotton; those who are not directly interested in this crop can make similar observations, with similar precautions, in the case of the one with which they have special concern. It so happens that cotton is a particularly useful plant for such work, chiefly because both the quantity and the quality of the produce that is required from it can be easily determined.

Those students who are interested in cotton are reminded that they should now obtain practice in judging lint by pulling it from the seed in the way mentioned in the *West Indian Bulletin*, Vol. VII, pp. 162, 163; practical assistance in this matter may be obtained from the officers of the Botanic Stations.

Remember that cotton for shipment must be carefully graded; that is to say the produce from various pickings must not be mixed, and that all stained cotton must be carefully kept separate from the rest. Information on this subject is contained on page 374 of Volume VII of the *Agricultural News*.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is it desirable to soak sugar-cane cuttings in Bordeaux mixture?

(2) What are the principal objects of pruning? Compare the results of frequent light, and occasional heavy, pruning of a cacao tree.

(3) What nitrogenous manures are chiefly used for ratoon canes? State whence their nitrogen is derived.

INTERMEDIATE QUESTIONS.

(1) How is water retained in soil, and how does the method of its retention admit of the simultaneous presence of air and water?

(2) What do you understand by the rotation of crops? What useful purposes are served thereby?

(3) Give an account of the uses that can be made of cotton seed.

RUBBER TREES AND GREEN MANURING.

A circular has recently been issued, by the Director of Agriculture, Nyasaland, dealing with green manuring in the tropics. The following passage from this circular, having relation to the subject in connexion with rubber, is of special interest:—

It has been proved that the flow of latex from a rubber tree is affected by endosmotic pressure, which practically means the amount of water in the plant roots. It is the practice to tap rubber in the early morning and evening, and to discontinue during the heat of mid-day and early afternoon. During the heat of the day much water is evaporated by the leaves, and latex flows slowly, but in the early morning and evening water wishes to enter by the root quicker than it is evaporated, with the result that there is an internal pressure which helps the flow of latex; therefore it is practical to assume that there is an intimate connexion between the presence of water in the surface soil surrounding the roots, and the flow of latex from the rubber tree. For half the year in Nyasaland there is no rain, and daily the sun is strong enough to evaporate water from the plants and from the soil. The question arises, where does this water come from? The answer is, from the lower layers or subsoil, by rising to the surface in the form of water vapour and water liquid (capillarity). In the surface soil of a clean-weeded estate the water during the day is principally in the form of water vapour, the water being vaporized to a considerable depth by the direct, overhead rays of the tropical sun. In the surface soil of an estate growing a green manure crop, there is a large proportion of the water in the liquid form, as the covering of vegetation reduces the temperature of the surface soil, and prevents the direct penetration of the sun's rays. Therefore, when rubber is growing surrounded with vegetation, its roots have actual access to liquid water through the greater part of the day. If we examine the same soils during the dry season after the green manure crop is dead, we still find more moisture in the latter, as the dead remains of the green manure crop absorb and retain water more firmly than ordinary soil, but deliver it freely to the rubber roots, although not as freely as to the atmosphere.

AGRICULTURAL SHOWS.

An account is given below of three agricultural shows that have recently been held. These were the Antigua Agricultural Show held on December 2, the Lancaster Agricultural Exhibition (Barbados), on December 8, and the Barbados Annual Agricultural and Industrial Exhibition, on December 22.

ANTIGUA.

The Antigua Agricultural Show was held at Buxton Grove grounds on Thursday, December 2. This is the ninth show which has been held in Antigua, the first having taken place in December 1900. It was opened by his Excellency Sir E. Bickham Sweet-Escott, K.C.M.G., who was received by the Committee of the Agricultural Society and the Superintendent of Agriculture.

His Excellency declared the show open and said that he felt it his duty to congratulate all who had worked to make it a successful one. The exhibits sent to the show this year were not as numerous as they have been in former years, although the number of entries made was quite up to the standard of previous shows; the heavy rains which fell for some days before December 2, may, in some measure, account for the difficulty experienced in sending exhibits.

The feature on this occasion was the excellence of the mules and oxen exhibited; there were a greater number of exhibits in the classes for live stock than in any previous show, but the quality of the small stock left something to be desired.

The school exhibits were again well to the front, the display of plants grown in boxes or pots being particularly good. The cup presented by the late Sir C. C. Knollys, for school exhibits, was won this year by Spring Gardens School; seven schools competed for this cup.

The sugar-cane exhibits were very fair. At the present time the cotton industry in Antigua is suffering from the set-back resulting from the previous unfavourable seasons, and the area under cultivation has been much reduced in consequence; moreover, the date of the show prevented exhibits of cotton from being sent by some estates, since it had not come into bearing everywhere. Nevertheless exhibits were sent in from all the estates which possessed bearing cotton, and the samples shown were all of excellent quality.

The fruit and vegetable section was disappointing, the exhibits being numerically small, though of fair quality. December does not appear to be as suitable for a good display of fruit and vegetables as a month later in the season, such as February.

The exhibits of the Imperial Department of Agriculture attracted considerable attention. Among these were a collection of green dressing plants, showing bush and seeds; stools of different varieties of cane, more especially those which have been newly introduced; specimens of rocks, illustrating the general geological formation of Antigua and the types of soils formed from them. Types of cotton and mounted specimens of the flower bud maggot, and of other plant diseases were shown, each exhibit being provided with a short descriptive label.

His Excellency Sir Bickham Sweet-Escott has presented a challenge cup which will be awarded each year for excellence in exhibits of live stock.

Financially, the show has been a success, and sincere thanks are tendered to the authorities at Buxton Grove, and to the judges and exhibitors who have helped to bring the Agricultural Show to a successful issue.

BARBADOS; LANCASTER SHOW.

The annual local exhibition for produce and stock of peasant proprietors and tenants on sugar estates was held at Lancaster plantation, St. James's parish, under the auspices of the Department of Agriculture and the Barbados Agricultural Society. For the purposes of the show, the yard and boiling-house of the plantation were placed at the disposal of the Department by the proprietor, Mr. J. H. Wilkinson, and the attorney, Mr. G. C. Edghill; the manager, Mr. Mandeville, also rendered valuable assistance.

The number and variety of the exhibits were not as great as those of former local shows; this was due to the fact that Lancaster is not situated centrally in respect of the populous villages in the country, so that the exhibits were not as widely representative as is usually the case. Considered, however, from a local point of view, they were generally good.

Of the cattle, the first prize in this class was gained by a half bred Zebu ox. The sheep and goats formed a good exhibit; most of the latter were of the Toggenburg breed, imported by the Imperial Department of Agriculture. The exhibits of poultry were, for the greater part, only fair. Of the vegetables, good lots of sweet potatos were shown; the yams and eddos were of fair quality. The fruit made a noticeable display, and its quality compared well with that of former years. A fair standard was reached by the garden produce; at present this is not allowed to include ornamental plants, so that these were absent from among the exhibits.

The exhibits from the elementary schools did not by any means compare well with those of former years, though they gave evidence of a creditable amount of care in some few cases. The comparative inferiority appears to have been due to the difficulty of taking the produce to be shown to the place of exhibition, and it has been suggested that some assistance should be given in the matter, in future.

At the close of the exhibition, the prizes were distributed by his Excellency Sir Gilbert Carter, K.C.M.G., who described the show as a very creditable one, urging at the same time, that nevertheless, more care in the preparation and presentation of the products was required, as the readier sale and possibly better price obtained would well repay the small amount of extra trouble entailed. Dr. Francis Watts, C.M.G., on behalf of the Committee, thanked his Excellency for being present and for distributing the prizes, and also returned thanks to all who had given assistance. In doing so, Dr. Watts pointed out that the dependence on the peasant of those in the West Indies for articles of use in everyday life was by no means completely recognized, and that the holding of agricultural shows had one of its greatest sources of importance in the opportunities that it gave for teaching the peasant how to improve and market his produce. He also referred to the use of school gardens in attaining these ends and in fostering the agricultural habit of mind. Dr. Watts gave a special warning in regard to the fruit industry, pointing out the serious results that were likely to accrue from the neglect to adopt measures against the spread of scale insects.

BARBADOS ANNUAL EXHIBITION, 1909.

This is wider in its scope than the ordinary agricultural show, as it includes a large number of industrial exhibits which are not the outcome of agricultural practice. As, however, space and prizes are given for the produce of the latter, a short mention of the exhibition is made here.

The exhibition was held at the old Ordnance Stores, kindly placed at the disposal of the Committee by Captain Owen, the Superintendent of the Royal Mail Steam Packet Company. For various reasons, the attendance was not as good as in former years.

In the horticultural section, the exhibits showed improvement on those of last year, both in number and quality. The show of fruits and vegetables was especially good, chiefly owing to the favourable growing weather that has been experienced; in this section there were chiefly in evidence yams, sweet potatos, eddos, pumpkins, cucumbers, various peas and beans, ground nuts, Indian and Guinea corn, ginger, lettuce, cabbages, citrus fruits and sorrel. The canes shown were not as good as might have been expected.

The show of horses was better than that of last year; the exhibits of cattle and goats were numerous, and generally good. The poultry, rabbits and hares shown were quite below the average. Pigeons and ducks, however, showed improvement.

Space does not admit of a description of the more purely industrial section of the show, several of the exhibits in which were of a specially interesting and useful character.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of November :—

During the early part of November the markets were for the most part firmer in tone than they had been for some time previously, but in the week ending on the 20th business was less brisk, and the news of the storm and floods in the West Indies had an immediate disquieting effect on several of the products of the islands; a week later, namely at the close of the month, the threatened doom of the Budget had a further disturbing effect upon the markets generally.

The following are the details specially referring to West Indian products.

GINGER.

No Jamaica was brought forward during the month, but at the last auction on the 24th it was stated that the crop was late in arriving, and in consequence, together with the serious reports of the floods, holders are asking advanced rates. In other sorts, at the first spice sale on the 3rd of the month, as many as 900 packages of Cochin and Calicut were offered, and 300 sold, 54*s.* being paid for unsorted native cut, 43*s.* for good, bold rough Calicut, and 35*s.* 6*d.* for small shrivelled, brown Calicut. In the following week, 140 bags of washed, rough Cochin were offered, and bought in at 40*s.* per cwt.; and on the 24th 280 bags of Calicut were offered, and 80 sold without reserve at 41*s.* 6*d.* for fair bright, rather lean; 45*s.* was wanted for good, bright, washed Cochin.

NUTMEGS, MACE AND PIMENTO.

In nutmegs, there has been no change since last month's report. At the second spice auction on the 10th, as many as 318 packages of West Indian were disposed of at previous rates. Mace has shown an advance in price, some 80 packages of West Indian were disposed of at the auction on the 10th, and realized the following prices; fair to good palish 1*s.* 8*d.* to 1*s.* 10*d.*, fair reddish 1*s.* 6*d.* to 1*s.* 7*d.*, dark red 1*s.* 5*d.* to 1*s.* 6*d.* and broken 1*s.* to 1*s.* 3*d.* At the last sale on the 24th, prices for the better qualities were slightly higher; good pale fetched 2*s*, fair pale and reddish 1*s.* 8*d.* to 1*s.* 9*d.*, fair red 1*s* 6*d.* to 1*s.* 7*d.* and fair to good 1*s.* 3*d.* to 1*s.* 6*d.* Pimento was quiet; at the beginning of the month 17 bags of greyish found buyers at $2\frac{1}{4}$*d.* to $2\frac{1}{2}$*d.*, on the 10th 88 bags were offered and bought in at $2\frac{3}{8}$. On the 17th, 351 bags were offered and a few only disposed of at $2\frac{1}{2}$*d.*, $2\frac{3}{4}$*d.* being demanded in most cases on account of the disastrous news from Jamaica. There was none offered at the last auction on the 24th.

Little or no interest has been taken in arrowroot throughout the month.

SARSAPARILLA.

There was no great demand for this article during the month; the following are the details in reference to it. At the first auction on the 4th there was no grey Jamaica offered; but for 8 bales of native Jamaica, out of 24 brought forward, the prices realized were, 10*d.* to 11*d.* per lb. for fair to good red, and 9*d.* for yellowish dull mixed. The other offerings were 36 bales of Guatemala and 14 bales of Honduras, all of which were bought in. A fortnight later the offerings were 41 bales of grey Jamaica, 6 of Lima-Jamaica and 10 of native Jamaica. The whole of the grey Jamaica was disposed of at the following rates: for slightly coarse and rough to good fibrous 1*s.* 1*d.* to 1*s.* 2*d.*, and ordinary rough 1*s.* per lb. The 6 bales of Lima-Jamaica of roughish quality were sold at from 11*d.* to 1*s.* per lb. One bale out of the ten of native Jamaica found a buyer at 8*d.* per lb., the remainder being bought in at from 9*d.* to 11*d.* per lb.

KOLA, CASSIA FISTULA, LIME JUICE, TAMARINDS, ETC.

At auction on the 4th 42 packages of kola were offered. For 15 bags of sea-damaged Ceylon $2\frac{1}{2}$*d.* to $3\frac{3}{4}$*d.* per lb. was paid, and 2 bags of West Indian sold at 3*d.* per lb. At the same sale, 4 cases of West Indian Cassia Fistula were offered, all of which sold at 16*s.* per cwt. for partially dry pods. In lime juice there has been but little demand; the quotation at the end of the month for concentrated West Indian was £17, and for raw West Indian 10*d.* to 1*s.* per gallon. Seventeen barrels of tamarinds were brought forward at the first auction in the month, and 10 of fair Antigua were sold without reserve in bond at 10*s.* 6*d.* per cwt. Some sales of West Indian distilled oil of limes have been effected at 1*s.* 5*d.* per lb. and it has been stated that hand pressed oil is worth 6*s.* A statement has been made during the month that there is a demand for cashew nuts, but at the end of the month 24 cases were brought forward and the whole bought in at 60*s.*

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated December 23, 1909, gives information as follows :—

The weather during the fortnight has been very wet, and considerable damage has been done to paddy remaining uncut.

Milling has been suspended in all factories other than those that employ artificial driers.

Shipment to West Indian islands amounted to 3,800 bags during the fortnight.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally 16*s.* 6*d.* to 17*s.* 6*d.* per bag of 180 lb. gross.
15*s.* 6*d.* to 16*s.* 6*d.* „ „ „ 164 lb. „

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, December 7, 1909; Messrs. E. A. DE PASS & Co., December 10, 1909.

ARROWROOT—1¼*d.* to 3⅞*d.*
BALATA—Sheet, 2/6½; block, 2/1½ per lb.
BEES-WAX—£7 17*s.* 6*d.*
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 50/- to 56/- per cwt.; Jamaica, 47/6 to 54/-.
COFFEE—Jamaica, 41/-.
COPRA—West Indian, £25 10*s.* per ton.
COTTON—Fully Fine, 18½*d.*; Floridas, 15½*d.* to 16*d.*; St. Croix West Indian, no quotation.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet; common to good common, 45/- to 49/- per cwt.; low middling to middling, 50/- to 54/-; good bright to fine, 55/- to 65/-.
HONEY—26/- to 33/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 8*d.* to 1/2 per gallon; concentrated, £17 10*s.*; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{5}{16}$*d.*; fair, 2⅜*d.*; good, 2½*d.* per lb.
RUBBER—Para, fine hard, 7/8, fine soft, 7/-; fine Peru, 7/6½ per lb.
RUM—Jamaica, 2/7 to 5/-.
SUGAR—Crystals, 16/3 to 17/6; Muscovado, 13/3 to 15/3; Syrup, 13/3 to 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., December 10, 1909.

CACAO—Caracas, 11c. to 12c.; Grenada, 11c. to 11¼c.; Trinidad, 11½c. to 11¾c.; Jamaica, 9½c. to 10½c. per lb.
COCOA-NUTS—Jamaica, select, $31·00 to $33·00; culls, $16·00 to $17·00; Trinidad, select, $28·00 to $30·00; culls, $15·00 to $16·00 per M.
COFFEE—Jamaica, ordinary, 8¾c. to 9c.; good ordinary, up to 9c.; and washed, from 10c. to 11c. per lb.
GINGER—11c. to 14c. per lb.
GOAT SKINS—Jamaica, 62½c.; Barbados, 55c.; St. Thomas, St. Croix, St Kitts, 50c. per lb.; Antigua, 52c., dry flint.
GRAPE FRUIT—$1·50 to $2·25 per box.
LIMES—Dominica, $5·50 to $6·50 per barrel.
MACE—32c. to 36c. per lb.
NUTMEGS—110's, 9c. per lb.
ORANGES—Jamaica, $1·25 to $1·50 per box.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 4·31½c. per lb.; Muscovados, 89°, 3·81½c.; Molasses, 89°, 3·56½c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., December 24, 1909.

CACAO—Venezuelan, $11·40 to $11·65 per fanega; Trinidad, $11·25 to $11·60.
COCOA-NUT OIL—90c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 10c. to 10½c. per lb.
COPRA—$4·15 per 100 lb.
DHAL—$4·25 per 2-bushel bag.
ONIONS—$3·75 to $4·00 per 100 lb.
PEAS, SPLIT—$6·75 to $7·00 per bag.
POTATOS—English, $1·70 to $1·75 per 100 lb.
RICE—Yellow, $5·10 to $5·15; White, $5·00 to $5·10 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., January 3, 1910; Messrs. T. S. GARRAWAY & Co., January 3, 1910.

ARROWROOT—St. Vincent, $3·75 per 100 lb.
CACAO—$10·50 to $12·00 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb., scarce.
HAY—$1·20 per 100 lb., unsaleable.
MANURES—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—Strings, $3·00 to $5·00 per 100 lb.
PEAS, SPLIT—$7·75 per bag of 210 lb.; Canada, $3·40 per bag of 120 lb.
POTATOS—Nova Scotia, $1·90 to $2·17 per 160 lb.
RICE—Ballam, $4·33 to $4·75 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, December 24; Messrs. SANDBACH, PARKER & Co., December 23, 1909.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·25 to $8·50 per 200 lb.	$8·50 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
CACAO—Native	11c. to 12c. per lb.	12c. per lb.
CASSAVA—	$1·08	No quotation
CASSAVA STARCH—	$6·00 to $6·50 per barrel of 196 lb. Sales—scarce	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	12c. to 13c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	13½c. to 13¾c. per lb.	14c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL	$4·05 to $4·10 per bag of 168 lb.	$4·10 per bag of 168 lb.
Green Dhal	$5·50 to $5·75	——
EDDOS—	$1·68 per barrel	——
MOLASSES—Yellow	22c. to 25c.	——
ONIONS—Teneriffe	——	No quotation
Madeira	4c. to 4¾c. per lb.	No puotation
PEAS—Split	$6·50 to $6·60 per bag (210 lb.)	$6·50 per bag (210 lb.)
Marseilles	$4·00 to $4·25	$4·50
PLANTAINS—	20c. to 48c. per bunch	—
POTATOS—Nova Scotia	$2·50	$3·00
Lisbon	No quotation	No quotation
POTATOS-Sweet, Barbados	$1·44 per bag	——
RICE—Ballam	No quotation	$4·75
Creole	$4·00 to $4·10	$4·00 to $4·30
TANNIAS—	$2·40 per bag	——
YAMS—White	$2·40	——
Buck	$2·88 per bag	——
SUGAR—Dark crystals	$2·55 to $2·75	$2·55
Yellow	$2·90 to $3·00	$2·80 to $3·00
White	$3·70 to $3·80	$3·60 to $3·80
Molasses	$2·00	$2·00 to $2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
„ Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Balance of Life in the Soil.

I. GENERAL CONSIDERATIONS.

A generation has passed since it was discoved that one of the chief causes of fertility in the soil, namely the formation of nitrates, is the outcome of a vital process, and this discovery was the beginning of investigations which have led gradually to a recognition of the importance to the agriculturist of the minute living beings which inhabit the soil. As long as the soil was regarded merely as a medium which provided water, air, support and a certain amount of chemically produced food for the roots of the plants which flourished in it, so long did experiments, which had been devised for the purpose of determining the conditions under which the soil would best fulfil the purpose of producing good plants in profitable quantities, give results which were in conflict with the expectations derived from the theories of the time. It is only since the recognition of the soil as the home of countless, quickly living beings that an adequate means of explaining the behaviour of plants in it, under varying conditions, has been supplied. Even now, there is much to be done, for investigations in connexion with such a complex of living and dead matter in speedy change as exists in the soil require time and much taking of pains before explanation and practical application of their results can be reached.

The great bulk of the soil is composed of particles, large and small, which owing to their shapes cannot completely fill the space, so that the interstices between them provide room for air and water, while their surfaces also supply a means of holding this liquid, and are inhabited by the minute living beings to which special attention is being given at present. Of the particles themselves, those which are composed of mineral matter undergo change which is comparatively slow; those which are organic in nature, however, alter quickly, especially at the temperature of the tropics, some of the changes being chemical in nature, while others are the outcome of the activity of the living organisms. In comparing the direct importance to the agriculturist of these two kinds of particles, that of the former must not be underrated, in view of their use as a source of slowly available plant food and of the fact that it is their nature which often helps to determine the amount of acidity or alkalinity of the soil.

A careful consideration of the history of a given area of soil makes it evident that it is in a constant state of change. In some respects it is undergoing a loss of actual matter, in others a gain of material is being made. As regards the first, water is always leaving it, through evaporation and transpiration by plants, as well as through drainage and percolation, the latter circumstances leading to a loss of soluble matter, in addition, while where the rainfall is heavy, there is a likelihood of a loss of bulk taking place through the washing away of the smaller, lighter particles. To these more mechanical causes of loss are added those of the action of denitrifying and, in many cases, putrefactive organisms, whereby nitrogen, carbon, oxygen and hydrogen are removed. Loss also takes place to a certain extent by the removal of such parts of plants as are carried away by the wind or by animals: by the former in connexion with the distribution of seed, and by the latter through accident, or purposely, for the provision of food, clothing, etc.

Considering again a definite area of soil, one of the chief sources of addition is, of course, the water which falls as rain, bringing with it the gases which it has dissolved during its journey through the atmosphere; through the air also arrive particles of matter and portions of plants which have been carried by the wind from other areas of soil. From below, it receives increments of matter by the weathering of the subsoil and underlying rocks. The carbon and much of the oxygen which are supplied in the remains of the plants that have lived and died upon it are an addition from the air. Nitrogen is added by the nitrogen-fixing bacteria and by those which live in symbiosis with leguminous plants. Lastly, matter is added to the soil by animals, either accidentally, or (as in the case of man) for the purpose of increasing the yield of the crops which grow on it.

An appreciation of these facts will lead to an understanding of the phenomena which are exhibited by the soil when it is subjected to different kinds of treatment. One of these, which has lately aroused particular interest, is sterilization, whereby the soil is placed under such conditions that the forms of life in it are partially or completely destroyed; it is now proposed to give more definite attention to this. A first effect of sterilization to be noticed was the increased fertility of the soil which followed it—a circumstance originally observed by Oberlin, when using carbon disulphide as a remedy against the phylloxera of the grape. Since then, investigations have been conducted with other sterilizing agents such as benzene, ether, chloroform, toluene and phenol, as well as in experiments where heat was employed; in the last connexion, Russell and Darbishire, in England, carried out an exhaustive series of trials by which they showed that heated soil will produce a yield twice as great as that from unheated soils, and that the effect of the heating will declare itself during four subsequent crops. Without such researches, the broad fact that soil which has been heated gives larger crops has long been evident to those who have observed plants growing on the sites where weeds have been burnt, or where charcoal pits have been made. It is not, however, a simple matter to provide an adequate explanation of the circumstance.

In the attempt to do this, various theories have been put forward; they may be divided into those which advance direct action of the disinfecting influence on the soil as the cause of the phenomenon, and those which attempt to explain it through its effect on the organisms in it. In the first division are included those of Moritz and Scharpe, and Pickering. The former endeavour to explain the action of carbon disulphide, in the connexion, by stating that this substance becomes changed into bodies suitable for plant food, in the soil—an occurrence which is very unlikely to take place, in consideration of the stability of that compound and of the small likelihood that it can be decomposed by bacteria. Pickering (see *Agricultural News*, Vol. VIII, p. 281) only goes as far as to draw a comparison between the action of disinfectants and that of heat in increasing the amount of the soluble organic matter in the soil.

Other explanations, as has been stated, have for their basis the alteration of the conditions in the soil as regards the micro-organisms which it contains. Hiltner and Störmer arrived at the conclusion that partial disinfection of the soil upsets the balance of bacterial life in it, with the effect that improved conditions arise on account of the resulting increase in numbers of the beneficial varieties of bacteria. Koch has suggested that the change is due to stimulation of bacterial growth, in the case of disinfectants, by the traces of those bodies which remain in the soil after their use, basing his theory on the well-known fact that poisonous compounds, in small quantities, often act as stimulants. Loew explains that, as the walls of dead cells permit the passage of all kinds of dissolved matter, owing to the destruction of the lining of protoplasm, the contents of the dead organisms pass out into the soil, thus enriching it chiefly with nitrogenous compounds and potassium phosphate, the process being aided by the property possessed by certain bacteria of producing enzymes (ferments) which

can dissolve the remains of those organisms. It is difficult to see, however, how sufficient plant food could be added to the soil, in this way, to account for the extent to which its fertility has been changed.

The latest attempt at explanation of the effect of the partial sterilization of soils also belongs to the category in which account is taken of the action of the disinfecting material or influence in altering the conditions under which micro-organisms exist in them. It has been made by Russell and Hutchinson, of the Rothamsted laboratories, and like that of Hiltner and Störmer, it has for its basis the effect of the change which takes place in the balance of life in the soil, but in a different way. As, however, in view of its interest and importance, it deserves discussion at some length, its consideration is deferred for the next number of the *Agricultural News.*

SUGAR INDUSTRY.

THE NEW YORK SUGAR TRADE LABORATORY.

The following information concerning the New York Sugar Trade Laboratory is taken from a paper read recently before the Louisiana Sugar Planters' Association. It illustrates the way in which a satisfactory arrangement between buyer and seller, for testing sugars, can be arrived at, the matter being simplified, of course, by the fact that both are situated in the same country:—

In the commercial testing of raw sugars for purposes of valuation, as in any other procedure that permits variations within a general method, the most satisfactory results are obtained by the adoption of a single set of impartial rules and by strict adherence thereto.

Up to some two years ago the methods employed in the commercial sampling and testing of sugars entering this country were regulated by the individual buyers and sellers. In consequence, varying results were obtained and there was found much trouble in arriving at satisfactory average tests as bases of settlements. A number of the larger buyers and sellers of raw sugars located at the ports of New York, Philadelphia, Boston, New Orleans, Montreal and Halifax, realizing the advantages of uniformity in sampling and testing, decided to establish a central testing laboratory at New York, where their sugars might be polarized.

Sampling may be done as the sugars are taken from on board ship, or the sugar may be placed in store and sampled when taken thence.

To secure samples, the representatives of buyer and seller alternately sample the packages and deposit their separate samples in a common receptacle. When the desired number of packages has been sampled, the accumulated sugar is thoroughly mixed before the final or net sample is taken. In some cases it is necessary to reduce the lumps by crushing, then to return this crushed portion to the gross sample.

Six tin cans of about 1 lb. capacity are filled to the top, closed and sealed by the samplers for both buyer and seller. Two of these cans go to the buyer, two to the seller, and two to the trade laboratory. The buyer submits his sample to an independent commercial chemist, while the seller submits his sample to another chemist. The trade laboratory makes its test and renders its report of test to both buyer and seller.

The three reports are compared and the average of the two most closely agreeing is taken as the true test. The third is thrown out.

The samples are mixed twice daily and sent to the laboratory. For purposes of identification, on each sample is pasted a label showing the name of the ship, time and place of sampling, mark, number of packages in the mark and in the sample, and buyer and seller. This information is recorded upon the books of the laboratory. One of the two cans received is stored for reference, and the other given a daily serial number and analyzed. Before analysis the sugar is emptied upon a clean, dry sheet of plate glass, and thoroughly mixed. Any lumps are crushed by means of a porcelain roller and again incorporated into the sample. Pieces of bags, baskets, mats, etc., that is foreign substances obviously not belonging to the sugar samples, are picked out by hand and discarded.

The work of polarization is then performed independently by two analysts, upon separate portions, and with entirely different apparatus. The method employed is that recommended by the International Committee for Unification of Methods of Sugar Analysis. The two results thus obtained are compared, and if found to agree within 0·2 per cent. they are averaged, and this average is recorded and reported as the Trade Laboratory's test. If the two results be further apart than 0·2 per cent. the sample is re-tested before it is reported.

The laboratory was established as a matter of experiment, but the satisfaction which has been given practically assures the permanence of the scheme.

WEST INDIAN SEEDLING CANES IN FLORIDA.

The following report on several seedling canes which were sent by the local Department of Agriculture, Barbados, to the Agricultural Experiment Station of the University of Florida has been furnished by Mr. John Belling, B.Sc., Assistant in Horticulture at that Station:—

On November 29, we tested the juice of five of the sugar-canes you kindly sent us. Though, on account of dry weather, we could not plant them out until as late as the end of May and June, yet B.208, though not quite ripe, has yielded a higher polariscope reading than any cane with an equal period of growth has ever done in Florida, to my knowledge. A reading of 15 is reckoned high here. B.208 stools well, and has stood the severe drought this autumn better, in my opinion, than B.3,412, B.3,405, or B.3,390. These three canes were unripe, but will have a long growing season and a fair test next year. B.147 was, of course, quite soft and unripe. B.3,412 may be good for syrup-making, and perhaps B.147, too. B.376 was slow to germinate and could not be tested.

Cane.	Brix.	Polariscope reading (Schmidt & Haensch).
B. 208	19·61	17·3
B. 3,390	18·37	14·5
B. 3,405	17·47	13·1
B. 3,412	17·57	12·3
B. 147	16·07	11·0

On the whole, it seems probable that more than one of the new canes may be an acquisition.

WEST INDIAN FRUIT.

THE COLONIAL FRUIT SHOW.

The thirteenth exhibition of colonial-grown fruit and British bottled fruits was opened by Princess Louise, Duchess of Argyll, who was accompanied by the Duke of Argyll, on December 1, 1909, at the Royal Horticultural Society's Hall, St. Vincent Square, Westminster.

The West Indian colonies were represented through the Permanent Exhibition Committees of Trinidad, Dominica and Montserrat, and by several private agencies; the arrangements in this section were entrusted to Mr. Algernon E. Aspinall, and Mr. W. G. Freeman gave valuable assistance. It was stated by Sir Trevor Lawrence, who hoped that such exhibitions would promote friendly rivalry between the colonies, that this exhibition was much superior to any of those which had been held before.

The Duke of Argyll, in replying to a vote of thanks to Princess Louise for opening the show, dwelt upon the advantages that were afforded by cold storage, in the transit of fruit from the colonies.

The exhibits from Trinidad not only included fresh, crystallized and preserved fruits, but specimens preserved in formalin, as well, in order to permit of the exhibition of fruits which were out of season, as well as those in season. (See *Agricultural News*, Vol. VIII, p. 404.)

The exhibit from Dominica was unfortunately smaller than was intended owing to the miscarriage of some of the crates and cases. One of the main objects of the Committee was, of course, to further the popularity of limes, and to aid in this, each visitor was presented with samples of the fruit in a bag which was conspicuously labelled 'Dominica Limes'. Besides the Permanent Exhibition Committee, the exhibitors in this section were the Dominica Fruit Growers' Association, the Botanic Station, and the proprietors of the following estates: Ancaster Park, Carholme, Everton, Wall House, Malgretout, Shawford, Corona, Castle Comfort, Pointe Mulâtre and Bramhall.

The exhibit from Montserrat included Sea Island cotton, preserves shown by the Montserrat Preserving Company, lime oils, papain, etc. A photograph of the produce of the island which had been offered for the acceptance of Her Majesty the Queen created much interest. (See *Agricultural News*, Vol. VIII, p. 393.)

Among the private exhibitors at the show were the West Indian Produce Association, the Jamaica Agency, and the Roseau Valley Fruit Company.

The West Indian awards were as follows :—

Gold Medals.—The Permanent Exhibition Committee of Trinidad (fruits and vegetables). The Permanent Exhibition Committee of Trinidad (preserves). The West Indian Produce Association (fruits and vegetables).

Silver Gilt Knightian Medals.—The Permanent Exhibition Committee of Dominica (fruits and vegetables). The Dominica Botanic Station (citrus fruits). The Jamaica Agency (fruits and vegetables).

Silver Knightian Medals.—The Permanent Exhibition Committee of Montserrat (fruits and vegetables). Wall House Estate, Dominica (limes).

Silver Banksian Medals.—Mr. J. G. De Gannes, Trinidad (King oranges); Messrs. Gordon Grant & Co., Trinidad (limes, and cocoa-nuts); Mr. J. G. Hains, Trinidad (cocoa-nuts); Roseau Valley Fruit Co. (jams etc., and fresh fruits).

Bronze Banksian Medals.—The St. Aroment Estate, Dominica (oranges); Everton Estate, Dominica (oranges); Corona Estate, Dominica (navel oranges); Carholme Estate, Dominica (limes); Mr. J. J. Browne (cocoa-nuts).

PURE STARTERS FOR BUTTER-MAKING.

One of the most important factors in determining the quality of butter and cheese is the 'starter' which is used to ripen the cream from which butter is to be made, or to hasten the acid fermentation of the milk for cheese-making. A starter is a quantity of milk in which acid-forming bacteria have grown until the milk contains large numbers of them. The addition of the starter seeds the milk or cream with great numbers of bacteria which are in a healthy condition and which by their growth cause the acid fermentation to progress rapidly and in a more definite manner than without the addition of the starter.

The factor that has the greatest influence in determining the quality of the butter or cheese to be made from a given quantity of milk is undoubtedly the quality of the milk itself. The quality of the milk depends upon the conditions under which it is produced on the farms, and on subsequent handling. It is impossible to make good butter or fine cheese from dirty milk; that is from milk having a high degree of acidity, or abnormal odours or tastes. The improvement of the milk supply can only occur through a change in methods on the farms. The cheese and butter maker can act only in an indirect manner by educating the farmer in better methods of producing and handling the milk and cream.

It is evident that the flavour of the butter will depend on the kind of substances formed during the acid fermentation of the cream, or during the ripening of the starter. If all the bacteria present are of kinds that produce no substance that will impart to the butter an objectionable flavour, the product will be good. If a part of the bacteria

causing the acid fermentation is of kinds that produce undesirable subtances, the flavour of the butter will be injured in proportion to the number of these forms as compared with the kinds that produce only desirable substances. The more the butter-maker is able to control the kind of acid-forming bacteria that is to grow in the cream, the greater control he will have over the flavour of the product. Modern methods of butter-making seek to give the maker this control, through the use of fresh, sweet cream; the pasteurization of cream, and through the use of pure culture starters.

In the propagation of starters, daily crops of bacteria are grown. The crop itself is invisible, but the changes which it produces in the soil—the milk in which it is growing—are very evident. The starter-maker is not handling so much milk—so much non-living material—but something in which there are living things—the bacteria—and unless proper conditions are provided for their growth, successful results cannot be expected. Good seed, favourable soil, temperature and moisture conditions are essential in growing any of our ordinary plants. Favourable conditions are just as essential in growing successful crops of bacteria, which are plants so small that they are invisible to the naked eye.

The starters prepared by the various commercial laboratories are known as 'commercial' or 'pure culture' starters They contain, as a rule, but a single kind of acid-producing organism. The starter-manufacturer has separated this form from all other kinds by methods that are easily carried out in the bacteriological laboratory. The bacteria isolated have been tested under practical conditions and found to possess the qualities that an acid-forming organism must have in order to make it a desirable one to use under practical conditions.

The package of starter which is purchased by the butter-maker is the pure seed. If the butter-maker considers it advisable to go to the expense of purchasing good, pure seed, it is surely advisable to devote the necessary time and labour in keeping the seed pure and in good condition. In order to do this the maker must pay attention to the following points :—

1. He must keep all other kinds of bacteria out of his starters, especially all other acid-forming bacteria; in other words, he must prevent the contamination of the starters.

2. He must pay attention to the soil in which his crops of bacteria are to be grown; that is to the selection of the milk to be used for starter-making purposes.

3. He must pay attention to the weather conditions, or to the temperature at which the starters are to be kept.

4. He must pay attention to the harvesting of the crop, that is to the time at which the starter is in the best condition for use.

By the term 'mother starter' is meant the small amount of starter that is to be added to the milk in the starter can, so as to prepare the quantity needed for addition to the cream, or to the milk for cheese-making.

In the past, the mother starter was usually a small amount that had been saved when the starter can was emptied. After the can had been cleaned, and filled with skim milk, which was then heated and cooled, the quantity of the starter saved was added to the milk in the starter can. More recently, many butter-makers have propagated their mother starters in a small way, entirely separate from the large starter prepared in the starter can. There are so many advantages in this method that it should be adopted by every maker. It enables him to meet the conditions necessary to keep his starters in a good state, with the least work and trouble.

A glass vessel should be used for the propagation of the mother starters, as such a vessel is smooth and impervious. One can easily see whether it is clean, and can note the condition of the starter as a whole much better than in a vessel with opaque walls, such as a jug. Gas bubbles are visible; it can be seen whether the starter is curdled, and whether whey is present; all of which give the maker information as to the quality of the starter. The vessel should be provided with a cover in order to prevent contamination from the air. The milk to be used for the mother starters should be of the best quality—as sweet and fresh, and free from all objectionable odours and tastes as it is possible to secure.

The milk selected will contain acid-forming bacteria, and unless these are destroyed they will grow along with those in the starter purchased, and the result will be a mixed or impure starter. In order to avoid this, milk is placed in the bottles in which the starters are to be made, the tumbler covers are placed in position, and the whole is heated, in order to destroy the acid-forming bacteria in the milk. The bottles should have been perfectly cleaned.

The following is a summary of a day's work in the preparation of a starter:—

(1) Clean the bottles, tumblers and spoons.

(2) Fill bottles with selected whole milk.

(3) Place a spoon in each bottle and cover each bottle with a tumbler.

(4) Heat long enough, so that the milk shall be heated to 180° to 195° F., for 15 minutes.

(5) Cool at once to the temperature at which starters are to be kept.

(6) As soon as cooled, inoculate. If the inoculation is to be made from a commercial starter, add the entire contents of the package. If the inoculation is to be made from a previously prepared starter, add an amount that experience has shown will ripen the starter in the desired time at the temperature to be used.

(7) Keep inoculated starters at constant temperature until ripe. If they are not to be used at once, when ripe, cool as much as possible and keep cold until they are used.

(8) Pour a small amount of the ripened starter into a cup. Examine by tasting, smelling, and determining the acidity.

(9) If the starter is satisfactory, inoculate a fresh bottle of milk from it, not from the cup.

(10) Never place a pipette, a thermometer, or any other object in a bottle of starter.

(11) Do not examine the bottle of starter directly. Always pour some into a separate vessel.

(12) Always keep the bottles of starters covered.

(13) Remember that you are attempting to grow crops of lactic acid bacteria, and that unless favourable conditions are maintained, the crop will not be a success.

(14) Remember that every effort must be used to keep all other kinds of bacteria out of the starters. (From *Bulletin* 181 of the University of Wisconsin Agricultural Experiment Station.)

Yield of Cocoa-nuts.—A good cocoa-nut tree should yield an average of one hundred nuts per year, and under favourable conditions two hundred have been obtained. Taking the whole island of Porto Rico, however, a return of sixty-five nuts per tree is probably about the average figure obtained, and no doubt conditions are very similar in the British West Indian islands. This low return indicates the general want of care and attention from which the industry is suffering. (The *Porto Rico Horticultural News.*)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 3, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 60 bags of West Indian Sea Island cotton have been sold: chiefly Barbados and St. Kitts at 18½*d.*, with a few of the latter at 19*d.*

Prices are generally about ½*d.* per ℔. dearer and there is a good demand at present rates, though at 19½*d* to 20*d.* American Sea Island is offering in quantity, without much business passing.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 1, is as follows:—

The sales were officially reported this week as only 250 bales, composed of cotton more or less off in preparation, such as factors were willing to dispose of at 30c., and such lots of Fine and Fully Fine as could be secured outside of the Exchange at 32 to 34c. The Exchange are continuing to hold for their prices, viz: Fine 33c., Fully Fine 35c., and Extra Fine 37c. The crop lots are held at 40c., and upwards, but with no inquiry as yet for them.

THE SIXTH INTERNATIONAL COTTON CONGRESS.

A voluminous report has just been issued, of the Sixth International Congress of Delegated Representatives of Master Cotton Spinners' and Manufacturers' Associations. A brief summary of the contents of this report has been furnished by the Chairman (Mr. C. W. Macara) of the Committee of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, from which the following extracts are taken:—

The Sixth International Cotton Congress was held in Milan last May, and was attended by delegates from the principal cotton-using countries in Europe, Asia and America. In addition to the records of the debates, there are included in the report many valuable papers contributed by delegates from the countries represented, which will prove of the greatest interest to everyone engaged in the cotton trade.

Prior to the Congress in Milan, meetings of the Committee of the International Cotton Federation were held in Rome, and the visit to that city was the occasion of the first joint conference with the members of the Permanent Committee of the International Institute of Agriculture. At that Conference a remarkable address, explanatory of the work of the International Institute of Agriculture, was delivered by Count Faina, its President, and this address is included in the report. About four years ago, this Institute was initiated by the King of Italy. The building in which the work is carried on was erected at His Majesty's personal cost, and was formally opened last year. The Committee of the International Cotton Federation has taken an active interest in the promotion of the Institute from its inception, and has, through its members, done much to enlist the support of the governments of the countries they represent, in contributing to the annual cost of carrying on the work of the Institute.

At present the attention of the Permanent Committee of the International Institute of Agriculture is being specially devoted to the two important staples—wheat and cotton. Great difficulties in establishing a uniform method of contributing data have been encountered, but when these are overcome, the reliability of the information which will emanate from the Institute cannot fail to be of the greatest service to mankind.

The International Cotton Federation, which, as is well known, was established in 1904, to deal with the crisis of that year, has since been working to bring the cotton interests of the world into line.

The two international organizations work along similar lines, and a close bond of sympathy unites them in their work. Along with the statistical returns of the annual consumption of cotton, and of the half-yearly returns of the raw material in spinners' hands, which have been issued for some years by the International Cotton Federation, there will be published, in time, statistics collected by the International Institute of Agriculture giving authentic information on the condition, growth and supply of cotton and other textile staples in all parts of the world.

Among the other matters dealt with by the International Cotton Federation may be cited the following: the expansion of the present cotton fields, and the opening up of new ones in any part of the world in which this can be done with success, and thus to broaden the area of supply; the more scientific cultivation of the raw material; improvements in the ginning, baling, warehousing and transport of cotton, especially American cotton, by which large savings can be effected; the international standardization of grades of cotton; reforms in the marketing of cotton (a new net-weight contract has been formulated and adopted); schemes for the regulation of the supply of the raw material, and for dealing with temporary overproduction of manufactures; mill fire insurance problems; and the perfecting of organization both national and international.

Finally, the International Cotton Federation is responsible for the present organized short time running, throughout

Europe, of mills using American cotton. Wild speculation in the raw material has completely upset confidence, resulting in a reduced demand from the great markets of the world at a time when there is overproduction of manufactures and general trade depression. These conditions together make organized curtailment of production an absolute necessity, and it would be suicidal to abandon this policy until the industry is brought into sounder and healthier conditions.

PINE TREES FOR THE TROPICS.

A valuable official report on the forests of British East Africa has just been issued. Among the many subjects with which it deals, that of the pines which are suitable for growing in tropical climates is of present interest, especially in view of the efforts that are being made toward reafforestation in some of the West Indian islands:—

The pines have their greatest development in cold countries; they mark the limits of tree vegetation going towards the North Pole. They are abundant, and show no loss of vigour in extra-tropical countries, both at high and low levels; the pines of the Mediterranean region and the pines of the Himalayas, of Yunan, and of Central America demonstrate this. But pines do more. They extend into tropical climates, pure and simple; witness the pine forests of Mergui, of Cuba and of the Philippines; while in Timor they are well into the southern hemisphere, though still in the tropics. When started by man in the extra-tropics of the southern hemisphere they grow with vigour, and at several points in South Africa have become completely naturalized. On Table Mountain and in the Cape Peninsula the introduced pines, *Pinus Pinaster* and *P. Pinea*, have been naturalized for about 200 years.

How far the artificial cultivation of pines in an entirely tropical climate could be attempted with success has not yet been proved; and in a country like British East Africa, which has both a tropical coast and extra-tropical highlands, pine-planting should be pushed forward with vigour on the highlands, but for the present tentatively and experimentally only on the coast. There is a demand for firewood at Mombasa, and this could probably be best met by planting *Casuarina equisetifolia*, as mentioned elsewhere in this report. Nevertheless, as regards tropical pines, it should be borne in mind, that some of them have hard, heavy timbers, suitable for use in the tropics, while the demand for firewood would absorb the otherwise waste wood in the slabs, tops and branches. Some of the tropical pines are no doubt as heavy and full of resin as some extra-tropical pines. *Pinus canariensis* has, in its heart-wood, a timber so full of resin, that it is almost imperishable, and weighs 60lb. to the cubic foot. Such a pine would furnish an ideal firewood for the Uganda railway.

The tropical pines that have been described and recognized as good species are the following nine (M. Masters.) :—

Pinus Merkusii, of Tenassarim and the Burmese lowlands.
,, *Khasya*, of the Burmese lowlands, and extending to 10,000 feet elevation.
,, *insularis*, of the Philippines and Timor.
,, *occidentalis*, of the West Indies.
,, *oocarpoides*, of the Mexican coast lands.
,, *cubensis*,
,, *terthrocarpa*, } of Cuba and the Isle of Pines.
,, *bahamensis*,
,, *massoniana*, of tropical China.

FEEDING COWS FOR MILK PRODUCTION.

Every cow has two limits with regard to feeding. Firstly there is a limit of capacity; that is, the total amount of feed the cow can possibly eat. Secondly, there is a limit to the amount of feed eaten that can be made use of in keeping up the energies of the body, and in producing milk. All food supplies between these two limits are worse than wasted; because they not only give no return whatever, but once in the stomach, it requires extra work for the cow to rid herself of the excess; thus using time when she could otherwise be at rest. On the other hand, when we consider that about 60 per cent. of the food eaten goes to carry on the workings of the different parts of the animal body, and that only the remaining 40 per cent. is available for milk production, we see how necessary it is, in order that the cow should do her best work, that the food should be just enough to reach the limit where economical production stops. This limit varies with every cow. For, perhaps, no two cows fed the same amount will both give the most economical returns. One of the cows, if fed a few more pounds a day, would give larger returns, but this might not be the case with the other. Hence there may be a considerable waste in feeding for milk.

This brings us to an important point. The dairyman should keep a complete record of each cow in his herd, including both a feed record and a milk record. Then, only, is he in a position to find the standing of each cow, and to tell which cows are profitable and which are unprofitable. Then, only, can he know how much feed he can afford to give to each cow to make the highest profit. In connexion with these facts, tests have been conducted with cotton seed meal, cocoa-nut meal, sorghum silage and sweet potatos. For the test with cocoa-nut meal and cotton seed meal, four cows were selected from the dairy herd and divided into two lots in such a way that the period of lactation in each lot would be as nearly comparable as possible. The feeding-time was divided into three equal periods of twenty-one days each, with seven days' preliminary feeding before each of these periods, so as to change the feeding gradually. Each lot received the same amount of bran and shorts, but the cotton seed meal and the cocoa-nut meal were not fed in equal, but in approximately equivalent, rations, which were calculated from the results of the chemical analysis, so as to contain equal amounts of protein. The conditions of the test with sorghum silage and sweet potatos were the same as given above, except that six cows were selected from the herd instead of four. The first test was undertaken to ascertain which of the two manufactured feeds it would be most profitable to employ as a milk-producer, at current prices. The second was to ascertain which of the two home-grown feeds it would be best to use as a milk-producer, taking into consideration the cost of growing them. The first test was conducted during July, August and September; the second during January, February and March. The results were as follows:—

1. One pound of cotton seed meal was found to be equal to nearly 2 lb. of cocoa-nut meal for milk production.

2. Cocoa-nut meal is only equally profitable, as a feed for milk production, at about half the price of cotton seed meal.

3. One hundred pounds of sweet potatos were found to be equal, for milk production, to 160 lb. of sorghum silage.

4. Sweet potatos are only as profitable as sorghum silage, for milk production, at about one and a half times the price of the latter. (From *Bulletin* 99 of the Florida Experiment Station.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The Balance of Life in the Soil is partially considered in the editorial of the present number. The subject will be further dealt with, in an editorial manner, in the next issue of the *Agricultural News.*

An account of the way in which West Indian seedling canes that are being grown in Florida compare with those that are common there is given on page 19.

The interests of the West Indies at the recent Colonial Fruit Show are dealt with on page 20.

An article on page 23 contains matter which is interesting in connexion with the subject of reafforestation in the West Indies.

The Insect Notes, on page 26, have for their subject The Insect Pests of Cocoa-nuts. Acknowledgement is made to the United States Department of Agriculture for permission to use the blocks for Figs. 2 and 4.

The property which some fungi possess, of attacking and destroying living insects, is of increasing importance in view of their possible use in controlling some of those which do injury to plants. Much information in connexion with the matter, in so far as it relates to scale insects, has already been given. An account of the entomogenous fungi of other insects than these appears under the heading of Fungus Notes, on page 30.

An interesting report on the fibre plants of India is abstracted on page 31.

The Fermentation of Cacao.

In view of the large amount of interest that is being excited by this subject at the present time, the following facts which have been elucidated by Dr. A. Schulte, from experiments conducted by him in the Cameroons, are here placed on record. *L'Agronomie Tropicale* (Vol. I, No. 10) states that this investigator divides the process of fermentation of cacao into two parts: (1) alcholic and acetic fermentation; (2) oxidation; and he considers that the production of good cacao depends on the way in which these operations are executed. During the first part, the pulp is separated from its seed, and, as the seed coat softens, a favourable chance is given for oxidation. This is the most important stage in the fermentation, and it depends for its success on the temperature. When oxidation has taken place under the best conditions, a white efflorescence is formed on the beans, and it should be continued until the greater number of the beans have become of a brown colour; if the operation is prolonged until all the beans have become brown, the taste and aroma are weakened. The time which is necessary for this oxidation can only be determined by experience; it varies according to the kind of cacao, the place where it is grown and the time of collecting the fruit.

The Exhibitions Branch of the Board of Trade.

A new Department of the Board of Trade has been formed for the purpose of assisting British exhibitors at International Exhibitions in the placing of their exhibits in advantageous positions, and in effecting various economies in connexion with this. The formation of this Department has been brought about through the discontent of manufacturers with the character of International Exhibitions in general, with the management of former British sections, and with the results of exhibiting. The Department has been placed under the direction of Mr. U. F. Wintour, the British Commissioner General. The effect of its assistance will be that, instead of every exhibition being treated as a separate problem of organization, the work will be done by a permanent department, whose duty is the care of British interests in such matters.

The first work of the Department will be to afford assistance in connexion with the International Exhibition to be held in Brussels from May to October of this year. In pursuance of this, a prominent space having an area of 203,410 square feet has been obtained for the British exhibits.

One of the advantages of the existence of such an organization is the fact that, as all the work is being done through one department, the exhibitor has been enabled to know beforehand exactly what his venture will cost him, and makes it possible for a uniform scheme of decoration to be applied to the British section. Other advantages are the provision of cheap printing facilities, and of a suite of rooms for exhibitors' agents, in connexion with which there will be a reference library, a staff of interpreters, and all the necessary equipment for the transaction of business, correspondence, etc.

Variability in Manihot Dichotoma.

Experiments which are being conducted at the Peradenyia Experiment Station, Ceylon, with this plant show that one of its characteristics is the great variability in vegetative characters. According to the *Tropical Agriculturist* of November 1909, observations on one-year old trees show that some of the leaves may almost be mistaken, on the one hand, for those of *Manihot Glaziovii*, while on the other hand, the leaf lobes of some are much longer and narrower, and possess a deeply wavy outline. Again, the seed capsules on some trees are nearly smooth (much like those of *M. Glaziovii*,) but larger, while on others, the capsules possess high crinkled ridges or wings. There is, however, no possible chance of confusing one with the other, because those trees which resemble the Ceara rubber in the shape of the leaves usually differ greatly in regard to the capsules, and vice versa.

One great interest of this variability is that it indicates the likelihood of a similar diversity in the yields of latex from the trees of the different kinds, and definite experiments will probably be undertaken for the purpose of gaining information in connexion with this.

New Test for Sucrose and Other Sugars in Condensation Water, etc.

The following abstract, taken from the *International Sugar Journal* of November 1909 (Vol. XI, No. 131), gives information concerning a new test for Sucrose and other sugars in condensation water, etc.

The method employed is as follows: 1 c.c. of a 5 per cent. solution of ammonium molybdate, and 2 c.c. of the liquid under examination are introduced into a test-tube; 10-12 c.c. of sulphuric acid are then carefully poured down the side of the inclined tube into the mixture.

In the presence of more than 0·0005 grams of sugar, a blue ring will appear in less than 20 minutes at the point where the aqueous mixture and the sulphuric acid meet. In solutions containing less than this amount, or, if no coloration is indicated, the upper layer of liquid should be heated to boiling point, when the blue ring will develop in less than 30 minutes, if only 0·00002 grams of sugar be present.

The reaction is thus seen to be very delicate. It may be employed for the purpose of differentiation between sugars.

Rubber on the Gold Coast.

According to the report of the Agricultural Department of the Gold Coast for 1908, the rubber at present exported from that colony is the product of several kinds of latex, the most important of which is that of *Funtumia elastica*. The jungle vine (*Landolphia owariensis*) also furnishes a good deal of ball rubber. The quality of most of the Gold Coast rubber is poor, owing to the ignorance on the part of the natives of improved methods of preparation, and their habit of collecting and mixing several different kinds of latex, whether they produce good rubber or not. Attempts are being made by the Department of Agriculture to effect improvement in this respect, for it has now been clearly demonstrated that rubber, which is second only to the finest Para in quality, can be made from the latex of *Funtumia elastica*. The jungle vine appears to be of slow growth, and not suitable for cultivation. Another indigent rubber tree which is worthy of mention is *Ficus Vogelii*, which produces 'Memleku' rubber. The latter, as at present obtained, is of a very poor quality, but there are indications that it can be improved, and this appears to be worth doing, as the trees yield a large quantity of latex. The product is somewhat like balata, and may probably be used for the same purposes.

Cotton Seed Oil and Woollen Manufactures.

In the Huddersfield District of the West Riding of Yorkshire, the chief industry is the manufacture of woollens and worsteds. For this, a large quantity of soap is used for the purposes of scouring, in order to remove perspiration, wool fat and mineral substances from raw wool, as well as oil from manufactured yarns and pieces. For making the soap, a large amount of cotton seed oil is employed, much of which comes from the United States; in addition, oil from seed crushed at Hull is used. Other uses for cotton seed oil in the same district are those of cooking, and of adulterating food substances and machine oils.

In connexion with the use of cotton seed oil for the woollen industry, the *Monthly Consular and Trade Reports* states that one firm in Huddersfield finds it profitable to run steam-driven wagons provided with large tanks to Hull for the purpose of transporting oil to its soap works, where 140 tons of soft soap are manufactured weekly.

The Biological and Agricultural Institute of German East Africa.

The Biological and Agricultural Institute of German East Africa is situated on the top of a hill about 3,000 feet above sea-level, at Amani in East Usambara, and is under the charge of a director, assisted by a staff of chemists, botanists, etc.; its experimental plantations spread over the slopes of the surrounding heights, and range in altitude from 1,300 to 3,000 feet.

Its chief object is the development of the agricultural resources of the country, by means of practical experiments, through the selection of such plants, seeds, etc., as are the most suitable, and by ascertaining the best and most economical methods of cultivation and treatment, and wherever possible to introduce the cultivation of exotic trees.

For the use of planters and others, who may desire to benefit by the experience gained at this institution, there is a guest-house with an extensive library attached to it, and the institute regularly publishes official pamphlets. There are also two planters' associations with their headquarters at Tanga and Dar-es-Salaam, in the country.

INSECT NOTES.

INSECT PESTS OF COCOA-NUTS.

Cocoa-nut cultivation is of considerable importance in the West Indies, and this importance seems likely to increase. During the past few years, large areas have been planted in cocoa-nuts, and as these young plantations are liable to be visited to a greater or less degree by insect pests, it may not be without interest to the readers of the *Agricultural News* to have a list of the known pests, with suggestions for their control.

Cocoa-nuts are attacked by three classes of insect pests: scale insects, white fly, etc., which suck the juice from the leaves; caterpillars which eat the leaves; and borers which tunnel into the stems and leaves. In the West Indies, a small white scale, which occurs in enormous numbers closely packed together on the under side of the leaf, is perhaps the most general in its distribution and the most severe in its effect on the tree, of all the cocoa-nut pests. This is the Bourbon scale (*Aspidiotus destructor*, Fig. 1). The cocoa-nut white fly (*Aleyrodicus cocois*, Fig. 2) is a very severe pest. Schomburgk in his History of Barbados ascribes the loss of the cocoa-nut trees in Barbados to this white fly, at least in very large part; it is a much more severe pest in Barbados than in other West Indian islands. The Bourbon scale, and any other scale that might attack cocoa-nuts may be checked by spraying with the oily washes recommended for scales of this kind, and these would also be useful for the white fly. In Cuba, the Bourbon scale is controlled by a natural enemy in the form of a small ladybird. Attempts to introduce into these islands this beneficial insect have, so far, not been successful.

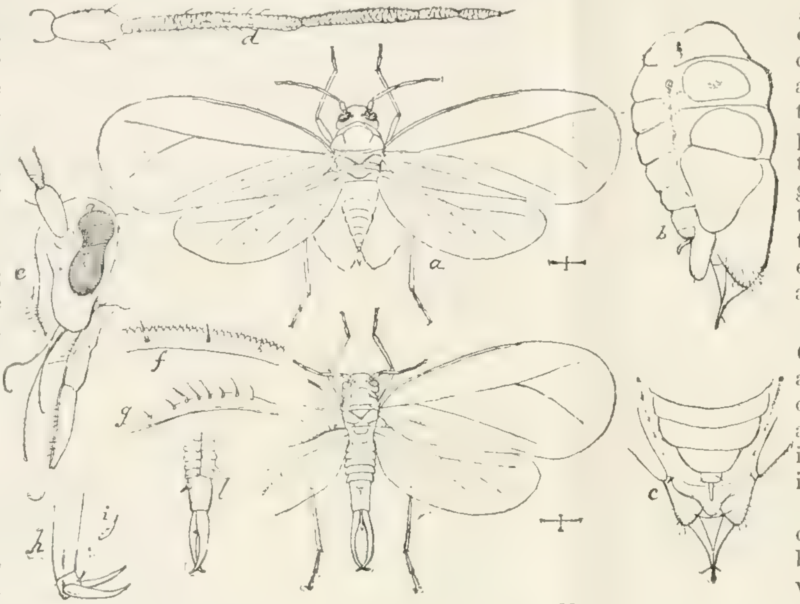

FIG. 2. COCOA-NUT WHITE FLY.

The large palm weevil (*Rhyncophorus palmarum*) is an occasional pest in most localities where cocoa-nuts are grown.

This is a large weevil or snout beetle about 2 inches long, the larvae of which tunnel into the stems of the cocoa-nuts.

The best method for destroying this insect depends on taking advantage of the preference of the adult female to deposit eggs on dead palm stems, rather than on, or in, living trees, and on pieces of the stems of palm trees lying on the ground under the growing cocoa-nuts. The adult beetles are attracted to these pieces, and by frequent examinations, many might be captured. If the pieces are left for a short time (four to five weeks), the eggs will be deposited, and the young beetle grubs will be feeding inside, and the pieces, with the grubs inside, may be destroyed in the most convenient manner. It is a bad practice, however, to have any parts of palm trees lying about on the ground in cocoa-nut groves long enough for the beetles to complete their life cycle and emerge to carry on the attack.

The larger moth borer, *Castnia licus*, is reported as attacking cocoa-nut and other palms in Trinidad, and a closely related species, *C. daedalus*, as attacking cocoa-nuts in Surinam.

In British Guiana, cocoa-nuts are attacked by a large caterpillar, which is the larva of a lepidopterous insect, that has been identified as *Brassolis sophorae*. This insect has been known for several years, and in certain instances, the damgae resulting from its attacks has been severe.

FIG. 3. WEEVIL BORER OF SUGAR-CANE.

The *British Guiana Gazette* of July 28, 1909, contained a report on this insect by Mr. F. A. Stockdale, B.A., Government Botanist and Assistant Director of Agriculture, in which a general account of its appearance and manner of attack are given, and suggestions are made for the control of it.

The caterpillars, when full-grown, are about $2\frac{1}{2}$ inches in length. They rest and feed in large colonies, and make nests by tying leaflets together with silk, which they spin for the purpose; as many as several hundred caterpillars may rest in a single nest, from which they come out at night to feed.

The remedy suggested is the very simple one of cutting out the nests and killing the caterpillars. A boy or man is sent up the tree to cut down leaves on which nests can be seen, while a man below crushes each nest, as it falls, with a wooden rammer.

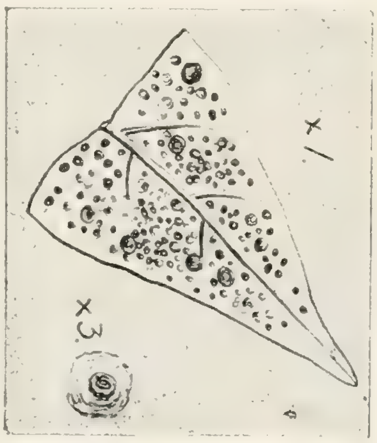

FIG. 1. BOURBON ASPIDIOTUS.

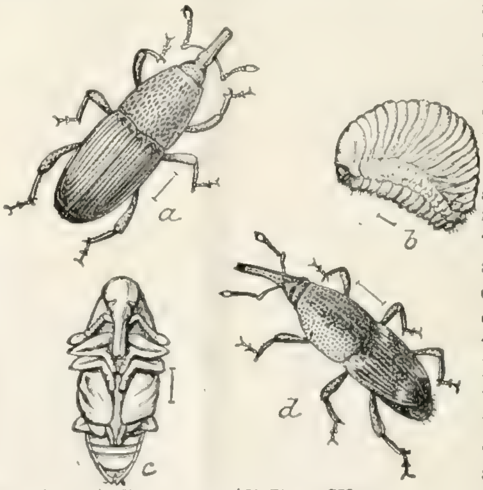

FIG. 4. (a) GRANARY, (d) RICE WEEVILS.

This seems to be an effectual method. Arsenate of lead may be used as a spray for this pest, in case spraying is adopted as a remedial measure.

In the *Experiment Station Record* for November 1909, p. 561, it is mentioned that *Brassolis isthmia* occurred in 1906 in such numbers in the Panama Canal Zone as to defoliate the cocoa-nut trees on the Isthmus and necessitate their being cut down. The caterpillars feed at night and remain in the nest during the day. The practice of cutting down the nests is said to be an easier method of control than spraying with arsenate of lead. A dipterous parasite is said to help in its control.

In a recent number of the *Journal of Economic Entomology*, Vol. II, 1909, p. 220, an article on insects affecting the cocoa-nut trees in the Society Islands mentions several pests which occur in the West Indies, as well as certain ones which do not. The Bourbon scale is mentioned as the most severe pest, while Glover's scale (*Mytilaspis gloveri*) is often abundant on the bases of the older leaves, where it is not supposed to cause much injury to the trees. It is also said to be heavily parasitized. *Mytilaspis gloveri* is not recorded on palms in the West Indies. It is a near relative of *Mytilaspis citricola*, and these two species have been found on citrus plants.

Two other scale insects are reported as being abundant on the cocoa-nut, one of them being held more or less in check by a small hymenopterous parasite. Two beetles are recorded, also, which bore into the base of the leaves. One of these (*Sphenophorus obscurus*) is related to the weevil borer of the cane (*S. sericeus*, Fig. 3); and the other *Calandra tahaitensis* is similar to our *C. granaria* (Fig. 4)—a small insect which lives on stored corn and other grain.

In the Society Islands, the leaves of the cocoa-nut are attacked by the larva of a small moth, which often occurs in large numbers, eating away the lower surface of the leaf, which dies as a result. Another small moth may prove to be a serious pest on account of the larval habit of eating the male flower-buds, as soon as the spathe opens. The flowers are often also attacked by two small beetles which feed upon the pollen. In some instances, practically all the pollen in the spike is destroyed.

THE COURSES OF READING IN ST. KITTS.

A communication from the Honorary Secretary of the St. Kitts Agricultural and Commercial Society (Mr. F. R. Shepherd) states that, at the meeting of that Society held on December 7, 1909, Mr. G. G. Auchinleck, B.Sc., read a short account of the work that has been done in that island in connexion with the courses of reading of the Imperial Department of Agriculture, at the same time offering advice as regards the help that might be given to candidates by the managers in charge of the estates on which they worked. Mr. Auchinleck congratulated St. Kitts on the success that had been attained so far, in the examinations of the Department, by the candidates from that island, but hoped, at the same time, that the number of these would be greatly increased in the future.

On the conclusion of Mr. Auchinleck's paper, the following resolution was passed unanimously by the meeting:—

'That this meeting of the St. Kitts Agricultural and Commercial Society desires to congratulate Mr. G. G. Auchinleck, B.Sc., Science Master at the Grammar School, on his promotion to a wider sphere of work, and to record its appreciation of the manner in which Mr. Auchinleck has identified himself with the agricultural interests of the community during his term of office here.'

AGRICULTURE IN ELEMENTARY SCHOOLS, TRINIDAD.

The following extracts showing the progress that is being made in the teaching of practical agriculture, together with nature study, in the Trinidad elementary schools, are taken from the Annual Report of the Inspector of Schools of that colony, for 1908-9:—

Practical agriculture is now taught in nearly all boys' or mixed schools of the colony. Omitting nineteen purely girls' schools, three infant schools and nine others whose head teachers, being women, naturally attract a preponderance of girls among the pupils, of the remaining 219 schools that were examined during the year, only eleven did not present this subject. There were therefore 210 schools examined in agriculture, as against 203 in 1907-8; of these, sixty-three obtained the highest award 'Very Good'—the number for the year before being sixty-seven. Thus, while there was a slight increase in the number of schools examined, there was apparently a little falling off as regards results. Here again, I would point out that the standard of efficiency is being gradually raised. Mere gardening, as generally understood in the colony, is good enough in its way, but we must have a higher aim in our schools. To know under what conditions to sow, plant and reap vegetables for consumption is important (and the annual local shows prove that a fair proportion of teachers are doing remarkably well in this direction), but for educational purposes it does not suffice; there is much more to be done, and it is being done by many earnest teachers. In several schools, pupils are allowed to conduct simple experiments in plant culture; compost heaps are formed, nursery work is carried on. In some that I have in mind, seed germination is taught in the best possible way by means of a bean or grain of corn in a glass or bottle of water, which if kept on a shelf or table in the schoolroom, where it can be always under observation, forms a continuous object-lesson. Then there is the kindred subject of nature study, which must form a part of agricultural teaching. It opens up a wide but most interesting field that the intelligent teacher will not fail to turn to account. With the services of the Agricultural Instructors now added to this Department, I trust to be able, in my next report, to show a real advance.

Successful local shows were held during the month of November 1908, and in January and February of 1909, at Princes Town, Port-of-Spain, Arima, San Fernando and Scarborough, but, unfortunately, those at the first and last named places were sadly marred by unpropitious weather. The exhibits at the various centres were, with one exception, more numerous and of better quality than in the previous year. The exception was at San Fernando, where the falling off in respect of both quantity and quality was somewhat marked, though probably the change of date at short notice may be in a measure accountable for it. Before each of the Trinidad shows, the principal school gardens near the respective centres were inspected by Mr. Adam Collens, of the Education Office, who has had some training in agricultural work. At all the shows, the display of flowering annuals was most disappointing, and it is really a pity that more effort is not made in this direction. The surroundings of many of our schools leave much to be desired, and the cultivation of flowers, whether in pots or beds, would not only help to brighten the scene, but would set an example which would doubtless be followed in due time by the peasantry in the neighbourhood.

GLEANINGS.

The distribution of plants, etc., from the Antigua Botanic Station and Experiment Plots for December last was as follows: cane plants 98,350, sweet potato cuttings 1,400, hay grass (*Andropogon caricosus*) 350, limes 200, cocoa-nuts 50, eucalyptus 47, palms 8, miscellaneous seeds 50 packets.

The *Diplomatic and Consular Reports*, No. 4,380, Annual Series, states that it is interesting to note that the *ABC of Cotton Planting*, published by the Imperial Department of Agriculture, has been translated into the French language, and published by the local Government in the official journal.

A remarkable development in the cultivation of sisal (*Agave rigida*, var. *sisalana*) has taken place in German East Africa. This is shown by the fact that the export has risen from 421 tons (value £16,205), in 1903, to 1,820 tons (value £67,408) and 2,830 tons (value £108,084), in 1906 and 1907, respectively.

The amount of cotton exported from the Nyasaland Protectorate during the year ended March 31, 1909, was 756,120 lb., of a value of £28,355. For the period 1907-8 the similar figures were 403,486 lb. and £13,999. The chief varieties grown are Upland and Egyptian. (*Colonial Reports—Annual*, No. 619.)

Particulars have been received from J. G. Childs & Co., Ltd., Hawthorn Road, Willesden Green, London, N.W., of air motors which are manufactured by this firm for providing electricity for such purposes as lighting, cooking, ventilating, charging accumulators for electrically driven vehicles, working lifts, irrigating and pumping, etc.

A curious application of the telephone has recently been made, that is, as an aid to the destruction of white ants. The modification employed for this purpose consists of a steel tube having a microphone at the upper part. Its use is to detect the places where the nests are present, and it is said to be effective within a range of 15 to 18 yards.

Dr. Olsson-Seffer has recently described two new Mexican rubber plants. One of these is *Jatropha urens*, which yields a product similar to balata, the method of collection being to cut off the branches and extract the rubber from them. The other 'plant' really consists of three species of *Plumeria*, from which the latex is obtained in a similar way.

A statement that has been made by H.M. Consul at Seville tends to show that the Seville sour orange crop of 1909 will be somewhat below the average in both quantity and general quality. Although the crop was below the average last year, considerable quantities remained unsold at the end of the season, even though the trade at Messina had been interrupted.

A report on the trade and navigation on the port of Havre (*Diplomatic and Consular Reports*, No. 4,323, Annual Series) shows that the imports of American cotton into France through this port in 1908 were 941,943 bales, against 827,240 bales in 1907. The imports of Indian cotton have fallen to 23,000 bales; this is on account of the reduced crop and high prices in India.

The syndicate appointed to consider the steps to be taken for the erection of a building for the Department of Agriculture of the University of Cambridge reports that the erection of the building is now practically completed, and that the fittings sanctioned are in a forward state. The syndicate anticipates that the building will be ready for occupation by the Department for the Lent term of the present year. (*Nature*, December 2, 1909.)

The report of the Director of Agriculture of the Federated Malay States (to which reference has already been made in the *Agricultural News*, Vol. VIII, p. 349) contains information that the sensitive plant (*Mimosa pudica*) is in many ways the most suitable plant that has yet been tried for cover in rubber plantations. The chief objection to it is the presence of thorns on its stems, which cause injury to coolies when they are walking through it.

A company called the Colonial Fibre Planting and Trading Company, Ltd., has been formed to acquire: (1) the fibre plantations, factories, etc., owned by Pita, Ltd., in the island of West Caicos; (2) the rest of the cultivable land of the island (about 600 acres), on lease from the Crown, for twenty-one years from July 1907, with the option of a renewal for a further twenty-one years. This places the company practically in occupation of the whole island. The capital is £100,000, in £1 shares.

A remedy for intestinal parasites in goats and sheep is given in the *Journal of the Jamaica Agricultural Society*, October 1909, as follows: Take dry tobacco leaves or stems and grind them to a fine powder. Mix 1 lb. of this powder with an equal amount of fine salt, and place it where the animals may have constant access to it. After a week, increase the quantity of tobacco, making the proportion 2 parts of tobacco to 1 of salt. This mixture, while harmless to the animals, kills all intestinal parasites.

The members of the Committee which has been appointed by the Secretary of State for the Colonies to give advice on medical and sanitary questions connected with the British Colonies and Protectorates in Tropical Africa are the following:—Mr. H. J. Read, C.M.G. (Chairman); Sir Patrick Manson, K.C.M.G., F.R.S.; Sir Rubert Boyce, F.R.S.; Mr. C. Strachey; Mr. W. T. Prout, C.M.G.; Dr. T. Thomson, C.M.G.; Professor W. J. Simpson, C.M.G.; Dr. J. K. Fowler. The Secretary to the Committee is Mr. A. Fiddian, of the Colonial Office.

The report of the Agricultural Instructor, Nevis, for December 1909, states that, although the area under cotton this season, in Nevis, is less than that of the 1908-9 crop, it is certain that very much more cotton will be reaped. All the ginneries are now very busy, and facilities are provided for the local purchase of cotton. It is also stated that, from the seedling canes grown in the nursery plots at the Station, over 8,000 plants of eleven varieties have been distributed to planters for trial in different parts of the island, and that there are several thousand more still available for distribution.

STUDENTS' CORNER.

JANUARY.

Second Period.

Seasonal Notes.

An examination of lime trees for scale insects will disclose the fact that the latter are not all of one kind; that is, they do not all belong to one species. Make a careful examination of the different kinds, in order to discover their chief characteristics, and to be able to distinguish between them. Pamphlets Nos. 7 and 22, published by the Department, contain descriptions which will assist in doing this. A still more careful examination of the scales will most probably disclose the presence of a fungus mycelium on and near some of them; an endeavour should be made to trace the fact that the mycelium often spreads out from underneath the scale, in each case. Why is the mycelium found there, and what interesting bearing has its presence on the problem of controlling scale insects? For descriptions of fungi possessing mycelia which behave in this way, see *Agricultural News*, Vol. VIII, p. 299.

These observations may well be extended to other plants, wild as well as cultivated, when it will be found that any given scale insect usually has more than one host plant. Careful note should be made of the different hosts in each case, and, if possible, the extent to which parasitization by fungi takes place; in this way, information of general value will be obtained.

Where lime trees show signs of being unhealthy, even though they are not being attacked by scale insects, an explanation of their appearance may be probably found in the presence of root disease. What are the chief ways in which root disease may seriously interfere with the functions of a root? In the case of healthy trees, observe that the upper layers of the soil are occupied by a tangle of roots. What does this suggest, in connexion with the methods of cultivation for limes? A careful examination of trees that have been recently pruned will show that this plant has a much smaller tendency to gumming, after pruning, than is the case with other citrus trees. Note that roots that have been injured by the hoe have the power, like the stem, of developing a tissue which heals the wounds. What part of the root is most concerned in the production of this tissue?

Interesting observations on the rate of development of the fruit of the lime may be made by marking some of the flowers, when they appear, by means of a piece of tape, or string, tied near them, and measuring the size of the fruit from time to time during its growth.

Make a study of the plant, or plants, which are used as wind-breaks for limes or cacao in your neighbourhood. Observe the effects of such shelters on the spread of scale insects. How do wind-breaks assist, to some extent, in the conservation of moisture in the soil of the area which they shelter? What other advantages result from their employment?

In the cane fields, where a new crop has just been put in, evidence will be given, at the present time, of the extent to which cuttings which have failed to grow have to be replaced. Note what treatment, if any, is being given to the fields in which young canes are growing? Where this is possible, a good opportunity of studying the making and use of drains, in the light of theoretical knowledge, will be afforded. Make observations on the manuring and mulching of the fields at this period. What uses have certain manures, in addition to that of the provision of plant food?

A useful exercise is afforded, at this stage, by carefully taking up a young cane plant, together with the cutting or 'top' from which it has sprung, and comparing it with an actually germinating seed. With what parts of the seed may (1) the 'rind' of the cane, (2) the sugar in it, be roughly compared? The plant growing from the seed is a new individual, while in the case of the cane plant, the latter is merely formed by the branching of a portion of the plant from which the cutting or 'top' was taken. How is this difference, in the case of the plant growing from the seed, brought about? What bearing have these facts on (1) variation in the sugar-cane, (2) its attack by fungus diseases?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How do leguminous plants enrich the soil?

(2) What signs would you look for when determining if a cacao tree was suffering from canker of the bark?

(3) State the best means of drying and keeping onions.

INTERMEDIATE QUESTIONS.

(1) Discuss the reasons for removing the 'mother plant' of the sugar-cane.

(2) What is anthrax? Describe the measures adopted to prevent its spread.

(3) Give the characters that should be shown by a good, marketable type of cotton. By what means may such a type be produced?

TRADE BETWEEN CANADA AND THE WEST INDIES.

In Antigua, on the 12th instant, a conference between visitors having interests in connexion with planting in Barbados (see *Agricultural News*, Vol. IX, p. 7) and delegates from the Agricultural and Commercial Societies of Antigua and St. Kitts, was opened by his Excellency the Governor. Among other matters, the subject of reciprocal trade relations with Canada was discussed, and the following resolutions were adopted unanimously:—

1. That the concessions empowering Canadian refiners to import sugar from non-preferential countries on preferential terms nullify the benefit of preferential treatment to the British West Indies.

2. That prices paid in Canada for muscovado sugar from the British West Indies are below the world's parity of prices, and show no evidence of preferential treatment.

3. That it being understood that, there exists a Board, appointed by the Canadian Government, dealing with the manner in which contracts by State-aided railways are carried out in relation to the commercial public, this meeting thinks it desirable that similar systems be adopted in connexion with any subsidized line of steamship and telegraph.

4. That it is desirable that a Trade Commissioner for the whole of the British West Indies be appointed to foster the sale of West Indian products in Canada.

5. That it is desirable that an improved and regular service of fast steamers, having adequate passenger accommodation, should be installed between Canada and the British West Indies.

6. That the views expressed by the representatives of Barbados, Antigua, and St. Kitts are in substantial agreement, and present a uniform story for the Royal Commission.

FUNGUS NOTES.

FUNGI ATTACKING INSECTS.

Several articles have appeared in the recent numbers of the *Agricultural News*, in which reference has been made to the fungoid parasites of scale insects; but many other insects, belonging to widely different groups, are liable to be attacked by fungi, and it is thought that a brief account of some of these parasites, and of the insects attacked, may prove of interest.

Flies are often attacked by a species of *Empusa*. Infected flies are frequently found on windows in a moribund condition. After death, the flies remain sticking to the glass, their bodies becoming dry and mummified, owing to the presence of a mass of fungal hyphae within them. At a later stage, the hyphae grow out from the body over the glass, and may form a white ring around it. The fungus is of general occurrence, and, in some seasons, large numbers of flies are killed by it. A closely allied fungus, belonging to the genus *Entomophthora*, has been found on spiders in Trinidad. *Mucor exitiosus*, like *Empusa* and *Entomophthora*, one of the lower fungi, has been considered to be the cause of a disease of locusts that is of wide-spread occurrence in South Africa; attempts to employ this fungus for controlling this pest have unfortunately met with but little success, and it is suggested that the disease is in reality mainly due to some other fungus, possibly *Empusa grylli*, which sometimes causes an epidemic among grasshoppers in the United States and other parts of the world. Grasshoppers attacked by *Empusa grylli* show a tendency to crawl upwards, usually on the stalks of plants, and cling tightly after death. The fungus also attacks certain caterpillars which exhibit the same symptoms when diseased. Cultures of this fungus have been used in the United States as a means of artificial infection, and in some cases they were very successful; a few insects were caught, dipped in the cultures, and then permitted to go free among the rest. Other members of the group Entomophthoreae are to be found attacking gnats, midges, certain mosquitos and scale insects.

Grasshoppers in the Argentine Republic are also attacked by a species of *Sporotrichum* (*S. globuliferum*). The dead insects are to be found in cool, damp places, such as the roots of grasses. The fungus is the same as that which kills chinch bugs in North America. The species of this group form a white or creamy mycelium, which eventually covers the infected insect, and then produces masses of spores, giving it a powdery appearance. The spores are borne on short, simple or branched conidiophores which arise as lateral outgrowths of the main hyphae. They are very small, usually more or less oval, and quite colourless. They may occur singly on the conidiophores, or may be grouped into heads, owing to the spores which have been formed adhering laterally to the conidiophores and to one another, as they are pushed aside by the next younger spore. White grubs, wasps, ants, aphids and scale insects, particularly those of the genus *Lecanium*, besides grasshoppers and chinch bugs, are attacked by members of this genus, to which the shield scale fungus of these islands may possibly belong. (See *Agricultural News*, Vol. VIII, p. 299.)

Some of the species of *Sporotrichum* very closely resemble the simplest conidial stage in the life-history of the genus *Cordyceps*, whose members attack all kinds of insects, as the larva, the perfect insect, and probably as the pupa. The fungi form a white or coloured mycelium in the insect, which eventually covers the surface in many cases, and there produces the first spore form, resembling that of a *Sporotrichum*. This spore form, however, varies considerably in the different species, and may have simple conidiophores producing single spores or heads of spores, or branched conidiophores sometimes bearing chains of spores, so that the fructifications closely resemble those of the genus *Penicillium*; the colour is also very variable. The next stage in the life history is the formation of the *Isaria* fructification This consists of an upright, conical or cylindrical body, usually somewhat pointed, formed by the close interweaving of the hyphae; the whole of its surface is covered with conidiophores bearing small conidia. The shape of the conidiophores varies, as also does the colour of the whole fructification. Finally, the perfect or ascigerous stage is formed. The stalk of the *Isaria* fructification thickens, and a spherical or cylindrical top is formed in which the perithecia are more or less sunken. The asci contained in the perithecia produce eight long filamentous spores, which frequently break up into numerous much smaller spores, and these are extruded as a fine dust.

The fungus is often found on dead caterpillars. These keep their original shape, but become filled with the mycelium of the fungus, which forms a sclerotium inside the skin. From this the fructifications arise, either directly, as the *Cordyceps* stage, or more generally with the intervention of the *Isaria* condition. Some species form the perfect fructification rarely, and only arrive at the *Isaria* stage, and some are most generally found in the first conidial form, only.

The insects attacked are very various, the most general being caterpillars both of moths and butterflies. The *Isaria* stage of *Cordyceps Barberi* is recorded as a useful parasite on the larva of the moth borer of the sugar-cane, *Diatraea saccharalis*, in Martinique and elsewhere. (*Agricultural News*, Vol. III, p. 135; Vol. VI, p. 3.) Another species is of common occurrence on the large Lecaniums. A specimen of the perfect stage of a sphinx moth, probably *Ancery.x fasciata*, is recorded as being attacked by *Isaria sphingum*, whose mycelium is of a yellowish colour. (*Agricultural News*, Vol. V, p. 138.)

Recently, specimens of the 'Jack Spaniard', *Polistes annularis*, and of a cotton stainer, *Dysdercus* sp., were received from Mrs. Patterson in St. Vincent. These showed a cream-coloured, cottony mycelium between the scales of the insects, accompanied by grey *Isaria* fructifications of some species of *Cordyceps*. The occurrence of this fungus on the cotton stainer is of interest, but it seems unlikely that it will be possible to make use of it from a practical point of view.

Another genus of fungi is known to attack insects, namely *Botrytis*. One species, *B. bassiana*, occurs on silk worms. Another, *B. eriophyes*, Mass., has recently been described as occurring on the black currant mite, *Eriophyes ribis*. (*Journal of Economic Biology*, Vol. IV, No. 1.) The fungus produces sterile, creeping hyphae, septate and vaguely branched. On these arise erect fertile hyphae bearing at intervals clusters of from three to six whorled conidiophores. Each conidiophore is acutely pointed at the tip and bears a single, erect, hyaline conidium. The fungus may be either parasitic on the mites or saprophytic on decaying leaves. It is of interest because the black currant mite is allied to the leaf-blister mite of cotton, *Eriophyes gossypii*, and it is possible that it might be successfully introduced into these islands. It is also possible that the same, or some other fungus occurs naturally here on the leaf-blister mite, but has been overlooked up to the present.

Any further observations with regard to the occurrence of different species of entomogenous fungi, particularly of the genus *Cordyceps*, would be of considerable value, and a request is made by the Department for useful information and specimens, from those who are interested in the subject.

FIBRE PLANTS IN INDIA.

The following are extracts from an important report which appears in the *Agricultural Journal of India*, Vol. IV, Part 4. It was drawn up by a Committee, for the information of the Board of Agriculture, in 1908, criticized by the Board, and then slightly amplified by the Committee on the basis of information obtained by the Inspector General of Agriculture from the Directors of Agriculture of the various provinces:—

The Committee limited consideration to particular crops:

(1) Ryots' (peasant's) crops—jute, *Hibiscus cannabinus*, *Crotalaria juncea*, and cocoa-nut.

(2) Capitalists' crops—rhea, Agave, pine-apple, Sansevieria and flax.

(3) Fibres worth experimental attention, e.g., plantain, Malachra and Sida.

JUTE.—At present, the cultivation of jute is practically confined to Bengal and Eastern Bengal and Assam. In both of these provinces, it is one of the most important crops, and its cultivation increased rapidly, owing to high prices, until 1907. During the last two years, however, there has been a diminution of between 30 and 40 per cent. in the area under jute, caused, partly by low prices, due to bad trade and to overproduction, and partly, by the great rise in the price of rice produced by famine conditions in Bengal and in other parts of India.

HIBISCUS CANNABINUS.—This plant is cultivated in many parts of India as a mixed crop, but rarely as a pure crop, except on the east coast of Madras, and, to some extent, in the jute-growing districts of Bengal. It grows excellently on well-drained land in a wet climate, such as may be found in the jute districts; but is capable also of thriving under conditions which would not suit jute without irrigation. In the last fact lies the importance of the plant.

CROTALARIA JUNCEA.—The fibre of this crop does not compete with jute as does that of *Hibiscus cannabinus*; but in market value it is superior to both. Sunn-hemp can best be grown in districts of moderate rainfall, and therefore does not compete with rice. It is, in some parts of India, frequently grown as a green manure crop before rice, and in others as a second crop in the same year after early rice, for fibre. This rotation is advantageous, because sunn is a leguminous crop. It is chiefly grown as a *kharif* (rainy season) crop for fibre, but also to a considerable extent as a green manure crop.

COCOA-NUT FIBRE.—The cocoa-nut palm is grown in all the coast districts of India, but to the largest extent in the southern portion of the Bombay Presidency and in Madras. In the Malabar Coast districts, the coir industry is a very large one, amounting to many lakhs of rupees per annum. In Bengal it is plentiful in the lower Gangetic basin; but it exists practically only in garden cultivation: there are no large plantations. The cocoa-nut palm is grown on a large scale in Bakarganj and Noakhali in Eastern Bengal and Assam, but the fibre is never extracted.

PLANTAIN FIBRE.—There are possibilities of a useful industry in plantain fibre. In many parts of India, the plantain is common in every garden; and in Bengal, Assam, the Bombay and Malabar Coasts, the Delta tracts of Madras and in parts of Burma, whole groves of plantains are quite common. The fibre of the plant which produces good fruit in India is usually, however, far inferior to that of *Musa textilis*—also a plantain—which is the source of Manila hemp. Moreover, the amount of fibre obtainable from a plantain in India is very small. It remains to be proved that a plantain fibre industry in India is a commercial possibility.

SIDA.—Species of Sida are quite common jungle plants in most parts of India; but in order to attain the length necessary for a fibre plant, the crop must be grown on well-drained land, either in a moist climate or under irrigation. Experiments under these conditions have been giving promising results. It is, however, necessary to overcome certain difficulties before recommending the crop for general cultivation.

AGAVE AND RHEA.—For the purpose of this note, Agave and rhea (ramie) may be taken together. The conditions of soil and climate suitable for these crops are now fairly definitely known. It used to be thought that Agave would grow and thrive on any soil and under any conditions of climate. It has, indeed, been stated that the poorer the land, the better Agave will thrive; but experience indicates that both Agave and rhea require good land for rapid growth. For the latter, also, a fairly heavy rainfall is required. Although it is possible to extract both Agave and rhea fibre by hand, the products obtained are usually inferior to those procured by machinery. Therefore, possibly, the cultivation of these plants should for some time, be continued by capitalists who can afford to pay for expensive fibre extractors. Rhea has been extensively cultivated on the estates of indigo planters in Behar, but has not proved a profitable crop. Both Agave and rhea require some years' growth before they give any considerable yield of fibre—a fact which discourages the ordinary ryot from attempting their cultivation.

FIBRE FROM PINE-APPLE AND SANSEVIERIA.—The extraction of fibre from pine-apple is not likely to become an extensive enterprise in any part of India. Sansevieria has been repeatedly tried by planters in Assam, but without paying results. It is possible that fibre can be profitably obtained from the pine-apple in Southern India.

FLAX.—Flax as a fibre crop is not yet produced on a commercial scale in India; but extensive experiments were begun in Bengal about four years ago, and are still in progress. They will, when complete, probably indicate that fibre of good quality can be profitably produced from this crop in several parts of India.

MALACHRA CAPITATA.—The Bengal Agricultural Department tried *Malachra capitata* ('monkey bush', in parts of the West Indies) at Cuttack, but gave it up as hopeless after two years' trial. Similarly, experiments conducted at the Rajshahi Experiment Station in Eastern Bengal and Assam indicated that its cultivation is not likely to be profitable.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated January 7, 1910, gives information as follows:—

The weather during the fortnight has been somewhat showery, and not too favourable for the drying of the cereals by the small farmers under their primitive methods.

Deliveries to town have not been as large as might have been expected, but this can be chiefly attributed to the holidays.

Shipments to the islands during the fortnight amount to 1,800 bags, being deliveries on account of existing contracts. Additional export sales have been made, and the demand appears good.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 16*s.* 6*d.* to 17*s.* 6*d.* per bag of 180 lb. gross.
15*s.* 6*d.* to 16*s.* 6*d.* „ „ „ 164 lb. „

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, January 4, 1910; Messrs. E. A. DE PASS & Co., December 24, 1909.

ARROWROOT—Quiet, $1\frac{3}{4}d.$ to $3\frac{3}{4}d.$
BALATA—Sheet, 2/7; block, 2/3 per lb.
BEES-WAX—No quotations.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 48/6 to 54/6 per cwt.; Jamaica, 47/6 to 54/-.
COFFEE—Jamaica, 38/- to 120/-.
COPRA—West Indian, £26 10s. per ton.
COTTON—Fully Fine, $18\frac{1}{2}d.$; Floridas, no quotations; St. Croix West Indian, no quotation.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 45/- to 49/- per cwt.; low middling to middling, 50/- to 54/-; good bright to fine, 55/- to 65/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, no quotations; concentrated, £18 5s.; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{5}{16}d.$; fair, $2\frac{3}{8}d.$; good, $2\frac{1}{2}d.$ per lb.
RUBBER—Para, fine hard, 7/7, fine soft, $7/0\frac{1}{2}$; fine Peru, 7/6 per lb.
RUM—Jamaica, 2/7 to 5/-.
SUGAR—Crystals, 16/- to 17/3; Muscovado, 13/- to 14/-; Syrup, 13/3 to 13/6; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., January 7, 1910.

CACAO—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, 11c. to $11\frac{1}{4}$c.; Trinidad, $11\frac{1}{2}$c. to 12c.; Jamaica, $9\frac{1}{2}$c. to $10\frac{1}{2}$c. per lb.
COCOA-NUTS—Jamaica, select, \$24·00 to \$25·00; culls, \$15·00; Trinidad, select, \$24·00 to \$25·00; culls, \$15·00 per M.
COFFEE—Jamaica, ordinary, $8\frac{3}{4}$c.; good ordinary, 9c. to $9\frac{1}{4}$c.; and washed, up to 11c. per lb.
GINGER—$10\frac{3}{4}$c. to 13c. per lb.
GOAT SKINS—Jamaica, 63c.; Barbados, 52c. to 55c.; St. Thomas, St. Croix, St Kitts, 50c. to 51c. per lb.; Antigua, 52c. to 55c., dry flint.
GRAPE FRUIT—\$1·75 to \$3·00 per box.
LIMES—\$3·75 per barrel.
MACE—34c. to 38c. per lb.
NUTMEGS—110's, $9\frac{3}{4}$c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—$4\frac{1}{4}$c. per lb.
SUGAR—Centrifugals, 96°, 4·02c. per lb.; Muscovados, 89°, 3·52c.; Molasses, 89°, 3·27c. per lb., all duty paid

Trinidad,—Messrs. GORDON, GRANT & Co., January 8, 1910.

CACAO—Venezuelan, \$11·75 per fanega; Trinidad, \$11·25 to \$11·60.
COCOA-NUT OIL—80c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 10c. to $10\frac{1}{2}$c. per lb.
COPRA—\$4·25 per 100 lb.
DHAL—\$4·40 per 2-bushel bag.
ONIONS—\$4·00 per 100 lb.
PEAS, SPLIT—\$7·00 to \$7·25 per bag.
POTATOS—English, \$1·70 to \$1·75 per 100 lb.
RICE—Yellow, \$4·80 to \$4·90; White, \$5·00 to \$5·10 per bag.
SUGAR—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., January 15, 1910; Messrs. T. S. GARRAWAY & Co., January 17, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$10·00 to \$11·00 per 100 lb.
COCOA-NUTS—\$14·00.
COFFEE—Jamaica and ordinary Rio, \$10·00 to \$11·00 per 100 lb., scarce.
HAY—\$1·20 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—Bunched, \$4·50 per 100 lb.
PEAS, SPLIT—\$6·50 per bag of 210 lb.; Canada, \$3·40 per bag of 120 lb.
POTATOS—Nova Scotia, \$1·75 to \$2·17 per 160 lb.
RICE—Ballam, \$4·20 to \$4·75 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, December 24, 1909; Messrs. SANDBACH, PARKER & Co., January 7, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·25 to \$8·50 per 200 lb.	\$8 50 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
CACAO—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
CASSAVA—	\$1·08	No quotation
CASSAVA STARCH—	\$6·00 to \$6·50 per barrel of 196 lb. Sales—scarce	No quotation
COCOA-NUTS—	\$12 to \$16 per M.	\$16 per M., peeled and selected
COFFEE—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	$13\frac{1}{2}$c. to $13\frac{3}{4}$c. per lb.	14c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL—	\$4·05 to \$4·10 per bag of 168 lb.	\$4·10 per bag of 168 lb.
Green Dhal	\$5·50 to \$5·75	——
EDDOS—	\$1·68 per barrel	——
MOLASSES—Yellow	22c. to 25c.	——
ONIONS—Teneriffe	——	No quotation
Madeira	4c. to $4\frac{3}{4}$c. per lb.	No quotation
PEAS—Split	\$6·50 to \$6·60 per bag (210 lb.)	\$6·50 per bag (210 lb.)
Marseilles	\$4·00 to \$4·25	\$4·50
PLANTAINS—	20c. to 48c. per bunch	——
POTATOS—Nova Scotia	\$2·50	\$3·00 to \$3·50
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	\$1·44 per bag	——
RICE—Ballam	No quotation	\$4·75
Creole	\$4·00 to \$4·10	\$4·00 to \$4·30
TANNIAS—	\$2·40 per bag	——
YAMS—White	\$2·40	——
Buck	\$2·88 per bag	——
SUGAR—Dark crystals	\$2·55 to \$2·75	\$2·55
Yellow	\$2·90 to \$3·00	\$2·80 to \$3·00
White	\$3·70 to \$3·80	\$3·60 to \$3·80
Molasses	\$2·00	\$2·00 to \$2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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CONTENTS.

The Balance of Life in the Soil.

II. THE EFFECTS OF STERILIZATION.

THE general considerations which were given in the last number of the *Agricultural News* in relation to the state of the soil, and to the changes which may constantly take place in it, led to a discussion of the effects that are obtained when the soil is subjected to influences which interfere with the balance between the different forms of living matter by which it is inhabited. The work of various investigators was shortly mentioned, including that of Russell and Hutchinson, the latest experimenters on the subject, the consideration of whose labours, in view of their importance, was reserved for this number.

In these experiments, the soil was treated in four ways, all of which resulted in partial or complete sterilization. In the first two, partial sterilization was effected by heating the soil to a temperature of 98° C., or by adding 4 per cent. of toluene, which was allowed to escape at the end of three days by spreading out the soil in a thin layer. According to the third method, the toluene was allowed to remain in the soil during the whole of the experimental period. As a fourth variation, a few experiments were made with soils that had been completely sterilized by being heated to a temperature of 125° C. A control was supplied by a fifth series of experiments, in which the soil was not treated. The soils, after treatment, were moistened and kept for definite periods in bottles closed by cotton wool, at the temperature of the laboratory. It may be mentioned that the sterilizing agent employed in two of the series of experiments—toluene—is a liquid hydrocarbon, very similar to benzene in its constitution and properties, which exists in light coal-tar oil, and is obtained when balsam of tolu, wood, and some other organic bodies are distilled. Like many similar substances it is very destructive to life of every kind.

The first result obtained in the experiments was that 'the increased productiveness of partially sterilized soils is due to an increase in the amount of ammonia present'. Considering the partially sterilized soils, it was found that, at the end of twenty-four days, the soil that had been heated to 98° C. showed the greatest increase in the amount of ammonia present; the soil that had been treated with toluene, which had subsequently been allowed to evaporate, came next; then the soil from which it had not been allowed to escape; while in the case of the untreated soil, the increase in

the ammonia content was insignificant in comparison. Other effects of partial sterilization were found to be an increase in the rate of production of unstable nitrogen compounds, and the destruction of nitrifying organisms. In this case, there is a difference between the action of heat and that of toluene, for in the latter instance, they thrive once more, on being re-introduced, while in the former they do not. It seems that, in the heating of the soil, some substance has been formed which is inimical to the existence of the nitrifying organisms: it may be the same body as was found by Pickering* to interfere with the germination of seeds, under the same circumstances.

The next step in the investigations was to discover the cause of the increase in the amount of ammonia. Two suggestions to account for this arise: (1) that some agency is present which causes increased production, (2) that some agent which continually consumes the ammonia under ordinary conditions, has been removed by the treatment. In the latter connexion, nitrifying bacteria do not enter into the question, as they have been proved to be completely destroyed by the sterilization. That the ammonia is consumed by any other agency was disproved by adding small quantities of ammonium salts and recovering them unaltered, except for a small proportion that had been converted into nitrates owing to the action of re-introduced nitrifying organisms. The results obtained led to the adoption of the first conclusion, namely that actual *production* accounted for the greater amount of ammonia that was present, with the additional inference that this was owing to the action of bacteria in hastening the decomposition of substances in the soil.

The question then arose as to why the bacteria should produce ammonia at an increased rate, after partial sterilization. Russell and Hutchinson confirmed Hiltner and Störmer's discovery that bacteria multiply more quickly and reach much greater numbers after that treatment. The rate of increase was determined, and this was found to be paralleled by the rate of increase of ammonia, thus giving rise to the inference, already stated, that the greater production of ammonia was due to the action of bacteria.

A detailed examination of this conclusion showed that there was no evidence that the kinds of bacteria which continue to exist after the treatment are stimulated to greater action by it—an explanation which, as has been stated already, is due to Koch—but that the contrary is actually the case, for certain forms that were isolated from the soil treated with toluene all showed less activity than those of the same kind from the untreated soil. Nor was Hiltner and Störmer's suggestion, to which reference has already been made, that the increased activity was due to a change in the type of bacteria that was present in the greatest numbers, upheld. The simple conclusion was reached: 'the increased ammonia production in the partially sterilized soil is due to the increased numbers of the bacteria.'

As this is the case, there must be some factor present in ordinary, untreated soils which limits the rate at which bacteria are produced, but which is removed by the action of toluene or heat. That this factor is not bacterial was shown by adding a filtered soil extract to a treated soil, when there was an increase of bacterial action, whereas if untreated soil was added to treated soil, there was no increase of such action, but rather a decrease. Thus the limiting factor must be something in the untreated soil which could not pass through the filter that was used for the soil extract. It seems that this factor is not a toxin, as has been suggested by Whitney and others, for this would affect the nitrifying bacteria most, as they are more sensitive than those which produce ammonia, yet nitrates accumulate in untreated soils.

The conclusion is reached that the limiting factor is a living organism or organisms, for, as was stated in the last paragraph, when untreated soil was added to the treated soil, the bacterial activity, and therefore the rate of production of ammonia, was promptly diminished. The further inference is made that the organism is probably large in comparison with bacteria, for it is only the soil, and not the filtered extract of the ordinary soil, that can produce the effect under consideration. Examination of the two kinds of soil showed that no large organisms were present in that which had been heated: in the soil treated with toluene, the larger organisms were also absent, only small ciliated infusoria being found: while all these organisms were present in untreated soil. As the large organisms are about one thousand times the size of bacteria, it is easy to understand that they are serious competitors with the latter, even apart from the fact that they probably effect actual destruction of the bacteria.

The work of these investigators, then, appears to show that the number of bacteria in the soil is limited by the presence of comparatively large, competing and destructive organisms, and that the increased fertility of soils that have been partially sterilized, is due to the killing of these, and the consequent increase in the rate of production of bacteria, with the concomitant increase in the rate of formation of ammonia.

*_Agricultural News_, Vol. VIII, p. 281.

SUGAR INDUSTRY.

SEEDLING CANES IN PORTO RICO.

The following facts in connexion with the sugar-cane varieties most commonly grown in Porto Rico are taken from a recent paper by Dr. D. W. May, the Special Agent in Charge of the Porto Rico Agricultural Experiment Station:—

The three most common varieties now grown in Porto Rico are the Crystallina, the Otaheite, or White, and the Rayado, or Striped. One variety will prove best in one locality, and prevail, while in other sections another will do best. Again, it is often found advisable to change the variety on a certain piece of land. It appears that not only does the rotation of the crop prove advisable, but that often a change in the variety will prove of advantage.

Two lesser known varieties in Porto Rico are the Penang, and Conangerie, or French, cane. The former grows well in very heavy wet lands, and the latter is very free from disease. The French cane is said to have been introduced from Mauritius during a time when disease was rampant, in the seventies. Neither of these two canes is in the first class as sugar producers.

The Experiment Station and Guanica Central are growing new varieties of cane from the seed in the arrow. Several thousand of these have already been produced, but sufficient time has not elapsed to test them thoroughly as sugar producers. In the meantime, a number of seedling canes produced and tested by the British stations have been under trial. A few comments on these will doubtless prove interesting.

A great many cuttings from these canes have been sent to planters in different sections of Porto Rico, and have been very favourably received. On the whole, they have proved superior to the old varieties, not only in showing increased sugar production, but in general hardiness and freedom from disease.

The laboratory tests, while of course, inconclusive, have shown a fair average increase in sucrose over the old varieties. Some mill tests made by the Guanica Central also showed very favourably for the seedling canes.

At the Experiment Station the following canes have given excellent results: D.95, D.117, B.347 and B.1,355. As resistant to drought, T.77, D.117, B.347 and B.3,289 have done well on the south side.

On the east end of the island, the preliminary tests of seedling canes have been very satisfactory. So far as tested, they are ranked as follows: T.77, B.3,289, B.317, D.117, D.95.

In Louisiana, D.74 is highly considered. In Porto Rico, however, while very sweet, this cane does not grow large enough, as it ripens early.

It is well suited to a short-growing season like that in Louisiana. Guanica Central, on the south side of Porto Rico, has now several hundred acres of seedling canes growing. The following results obtained there are of interest and value:—

Ponce District, canes planted 5½ feet by 5½ feet, Oct., 1907; harvested Dec. 22 and 23, 1908. All varieties fertilized, irrigated and cultivated alike. Weights taken at mill:—

Cane.	Tons per acre.	Sucrose, per cent.	Purity.
Otaheite	56·38	12·7	80·9
T.77	65·42	15·1	83·0
D.117	56·45	15·4	83·2
D.95	52·77	15·8	87·3
B.1,753	52·99	12·8	78·5
Crystallina	52·08	13·4	79·3
D.74	49·01	17·6	88·4
W. Bamboo	47·52	13·2	78·1
Tibboo Merd	43·46	13·6	83·3

Hacienda Monserrate, canes planted 5½ feet by 5½ feet, Sept. 25, 1907; harvested Dec. 29, 1908. All varieties fertilized and cultivated alike:—

Cane.	Tons per acre.
White Bamboo	64·66
D. 117	64·60
B. 347	60·24
Tibboo Merd	52·51
D. 95	60·48
D. 74	54·27
F. 2	12·85

IMPLEMENTAL TILLAGE IN ST. VINCENT.

In the last number but one of the *Agricultural News*, an abstract of the report of the Agricultural Instructor for St. Vincent, on his visit to Antigua in connexion with implemental tillage was given. Since that report was made, implements for the purpose have been imported into the island, and trials have been made with them, as appears from the following account, which is taken from the St. Vincent *Sentry* of the 7th instant:—

At the invitation of his Honour the Administrator, a large party of planters, and others, were present at a most interesting, and instructive, demonstration in implemental tillage at Arnos Vale Estate on Wednesday last. Among those present, besides the Administrator, and the local Officers of the Agricultural Department, were his Honour the Chief Justice, the Hon'bles J. B. Kernaham, C. J. Simmons and D. A. McDonald; Messrs. A. Smith, W. C. Hutchinson, J. A. Robinson, Alex. Fraser, G. Robertson, J. Punnett and F. Corea.

The work already done on the 9-acre experiment plot was inspected first of all. This field had been put in banked cultivation solely by the different implements recently obtained by the Imperial Department of Agriculture. Those present expressed themselves very favourably on the results obtained. After the plot had been examined, the following implements were used on an adjoining plot of land which had been close-ploughed:—U-bar harrow, Cuban double mouldboard fluke, Orleans disc cultivator, and union corn drill or cotton planter.

These implements clearly demonstrated the method of preparing lands for cane and cotton, and showed how quickly and thoroughly the work was done.

Towards the close of the afternoon the Planet Junior horse-hoe, and orchard harrow were used in a field of plant canes, and here again, the value of implements for weeding and moulding the young plants was clearly seen.

We understood that already, as a result of the experiment, several implements are being ordered at an early date by planters for trial on their estates.

WEST INDIAN FRUIT.

PRODUCTS OBTAINED FROM CACAO.

The three cacao products known to commerce are: cacao butter, cacao powder, and cake chocolate, the manufacture of chocolate requiring skill and knowledge in special degree. The butter is merely the oil or grease of the kernel, usually extracted by pressure, and leaving a residue still containing a certain amount of vegetable fat, which, being ground as will be explained later, is used in making the beverage commonly known as cocoa. When chocolate is intended to be produced, the carefully cleaned kernels are crushed into a mass, flavoured and manipulated according to many methods, and then, after an addition of pure cacao butter has been made to the natural content of the mass, it is pressed into small cakes, and sold.

The cacao bean is composed, by weight, of 88 per cent. of kernel and husk and 12 per cent. of shell. The shells and husks are treated chemically in Holland for the production of a low-grade butter, the reduction being effected by ether or benzene. The kernel, which contains 50 to 55 per cent. of oil, was formerly treated, when the extraction of butter was contemplated, by boiling, roasting and crushing in ten times its weight of water; the oil then rising to the surface was decanted, and the residue pressed mechanically for the elimination of such butter as it still contained. This method has been abandoned, and the kernels, freed from their envelopes, are now ground to a mass, brought to a temperature of from 60° to 70° C., placed in coarse linen sacks, and finally pressed in steam-heated machines. After this first application of pressure the cacao cake contains from 20 to 35 per cent. of fat; it is then ground and re-pressed until not more than 15 per cent. of the fatty matter remains. The oil or grease which has been extracted is called 'cacao butter', which is used chiefly by chocolate manufacturers, and, in smaller quantities, in the soap, perfumery, and pharmaceutical industries, in which, owing to its neutral qualities, it is especially valuable.

Fresh cacao butter is yellowish white, but if exposed to light, it becomes entirely white, and possesses a mild odour of the cacao and a sweet and agreeable taste. Both taste and odour are eliminated by boiling the fat with absolute alcohol, and in this condition it keeps a long time without becoming rancid. It is firm in consistency and melts at from 32° to 35° C., according to quality. Its density varies from 0·890 to 0·900 at 15° C. It is very soluble in ether, acetic ether, chloroform and essence of turpentine. It is sometimes adulterated with a mixture of stearin, paraffin, and beef fat. If it is mixed with fatty oils it melts at a temperature of less than 25° C., and if it is mixed with paraffin and beef fat it melts at a temperature in excess of 35° C. If pure, the point of fusion should not be less than 25° nor more than 30° C.

The butter having now been withdrawn from the mass there remains an oily cake, which is ground to a fine powder, and commands a very wide sale. The powder is usually prepared, according to the Dutch method, by the addition of a solution of chemically pure potash. Less frequently, soda is used instead, or perhaps a solution of ammonium carbonate. In ordinary practice, the raw beans with their shell might be expected to yield from 40 to 45 per cent. of their weight in butter, and 30 per cent. of cacao powder. (*Monthly Consular and Trade Reports*, October 1909.)

THE DRAINING OF CACAO LAND.

The following information in connexion with the draining of cacao land is taken from the series of articles on cacao, by Mr. J. H. Hart, F.L.S., that are appearing in the *West India Committee Circular*. Abstracts from these articles have also appeared in the *Agricultural News*, Vol. VIII, pp. 260, 292 and 340.

In draining, as in pruning and road-making, only general principles can be laid down. All land, of course, requires draining of some kind or other, but no one can give definite instructions for draining an area until it is understood what amount of drainage that particular area requires. Land situated at a low level will, of course, require much more attention to rid it of superabundant water than will hillside land, and each area must therefore be treated according to its own requirements.

The object of drainage is to rid a cacao estate of stagnant or superabundant moisture. Flood waters from a river, so long as they do not cover an estate for too long a period, do but little practical harm; indeed, in some districts they are looked upon as doing a large amount of good by bringing down, and depositing upon the surface, a certain amount of manurial constituents.

Drains made in any kind of cultivation should always be V-shaped, with a narrow bottom. The practice of making drains with upright sides, which fall in and choke the drain, cannot be too strongly condemned, and can in no case be recommended; and the depth and width of the drains should be regulated by the circumstances of soil and situation. They should never be made straight in coming downhill, as when so made, the wash becomes enormous, especially if the decent approaches an angle of one in twenty; but in flat land the straighter they are made the better.

The site for a plantation should always be selected where there is a good natural main outlet for drainage waters.

'Under draining' with pipe, rubble or a bush base is, I consider, utterly useless in cacao cultivation, as it stands to reason that such drains must very early be filled by the roots of the trees (both cacao and shade trees), and that the action of the drains after the first few months will be stopped by the roots finding their way into them in search of moisture. The theory is good, but the practice is quite unsound with regard to cacao. It is different in lands on which cereal crops are annually cultivated, for there the roots seldom or never reach to the drains during the period of growth, and consequently, the drains themselves work from year to year without let or hindrance; but the principle cannot be effectively applied on cacao estates. The planter should therefore trust entirely to his surface drainage, and make that system do the work to the best advantage.

GREEN DRESSINGS IN ANTIGUA AND DOMINICA.

The following is an account of experiments and observations that have been conducted and made in connexion with green dressings in Antigua and Dominica by the Curator of the Botanic Station, in the former island, and by the Assistant Curator, in Dominica:—

ANTIGUA.

At the present time, in Antigua, the problem is to find out what kind of dressing should be grown. The ideal plant for this purpose would be a quick-growing, insect- and disease-resisting leguminous plant. It is of importance that a quickly growing crop should be sought, for in some cases the time between the planting of the dressing and the final preparation of the land for the planting of sugar-cane is not great, often not more than three or four months. On some of the larger estates, however, a certain proportion of the land is rested for nine to twelve months. When the term of fallow is for such a period the importance of using a quickly growing dressing is not so great. It is evident, however, that if such a practice were to be adopted in all cases, it would be a great factor in minimizing the severity of the attacks of pests of the sugar-cane, probably more especially those of a fungoid nature, which are of vital importance.

A point that is sometimes not taken into account is that the quantity of green material yielded by a dressing does not represent the amount of solid material returned to the soil. It is well known that the greater part of the weight of a plant is made up of water. The following figures, which give an approximate idea as to the amount of moisture contained in some plants used for this purpose, may therefore be of interest:—

	Loss after drying in air, per cent.
Woolly pyrol	76·3
Barbuda bean	73·5
Ground nut	71·1
Lima beam	73·5
Soy bean	31·6

All the above, with the exception of the soy bean, were weighed five days after cutting, the soy bean being weighed seven days afterwards. The great difference between the amount of water contained in the soy bean, when compared with that of the others, is explained by the numerous seeds formed by this plant.

It was thought that it might be interesting if the lengths of the roots of the different plants used for green dressings were taken. It is known that the roots of plants which use different layers of soil for the obtaining of their plant food flourish better when grown together than when grown with those which utilize the same layer for this purpose: it is thus probable that deeply rooting plants would be of value in placing at the disposal of the subsequent crop, plant food in an assimilable form, which otherwise would not be within its reach. This would perhaps be the case when the subsequent crop is one similar to the sugar-cane, most of the roots of which form a dense mass in the top 4 or 5 inches of soil.

Measurements of the main roots which were actually made gave the following results:—

	Days after planting.	Length of root, inches.
Java Crotalaria (*Crotalaria striata*)	240	19½
Barbuda bean (*Phaseolus lunatus*)	66	16
Cowpea (*Vigna unguiculata*)	80	13½
Lima bean (*Phaseolus lunatus*)	66	13
Woolly pyrol (*Phaseolus Mungo*)	66	11½
Ground nut (*Arachis hypogaea*)	66	8½

The approximate areas of land in different green dressings in Antigua, during 1909, are given in the following table. The larger figures must not be taken as representing the crops most popular in Antigua for the purpose in question, but as showing to a great extent the amount of seed available for planting purposes, at the time of sowing. This is especially so in the case of the soy bean.

	Area, acres.
Pigeon pea (*Cajanus indicus*)	199
Soy bean (*Glycine hispida*)	138¼
Cowpea (*Vigna unguiculata*)	132
Barbuda bean (*Phaseolus lunatus*)	112
Woolly pyrol (*Phaseolus Mungo*)	42
Wina (*Teramnus parviflora*)	4
Miscellaneous leguminous plants	7
,, non-leguminous plants	7½
Total	641¾

DOMINICA.

Early in May of this year, a few seeds of *Canavalia gladiata* were received at the Agricultural School, to be grown for comparison with the horse bean, *C. ensiformis*.

The seeds in both cases were sown in rows on the flat, 4 feet apart each way. The horse beans germinated in six days; *C. gladiata* took twelve days. A few weeks later, the difference in habit of growth was very marked: the horse beans were very compact, about 8 inches high, bearing seven large compound leaves to every 12 inches of stem. *C. gladiata*, on the other hand, had long twining stems bearing two leaves on 3 feet of stem, the leaves being much smaller than those of the horse bean.

Ten weeks after sowing, the horse bean was in flower, and five of the best plants were uprooted and carefully weighed. They were then put to dry in the shade for three weeks and again weighed; at this time the plants of *C. gladiata* were creeping slowly, and giving growth to many lateral shoots.

Four weeks later, the last-named plants were in flower; they had an average spread of 3 feet. Five of the best plants were uprooted, weighed, dried and reweighed.

There was no difference in the weight of each set of five plants. They both weighed, when green, 10 ℔.—an average of 2 ℔. per plant, and both lost on drying, 6 ℔.

It would appear that if the green dressing is required as a catch crop, the horse bean is more useful. If, however, the time the crop occupies the land is of little or no consequence, and if the chief object is to keep down weeds, then *C. gladiata* would probably be found to be serviceable.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 17, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 70 bales of West Indian Sea Island cotton have been sold at firm prices. The sales include Barbados 18½*d.* to 19½*d.*, Montserrat 18½*d.*, and superior St. Kitts at 20*d.*

During the last day or two there has been a tendency to press sales of American Island cotton, and cotton is being offered from Charleston at about 1*d.* per lb. decline from previous pretensions.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 15, is as follows:—

The market remained quiet again throughout the week, with factors still holding at last quotations, viz: Fine 33c., Fully Fine 35c., Extra Fine 37c. The Exchange reported sales of 150 bales, which consisted principally of cotton more or less off in preparation, at 30c.

COTTON-GROWING IN CHINA.

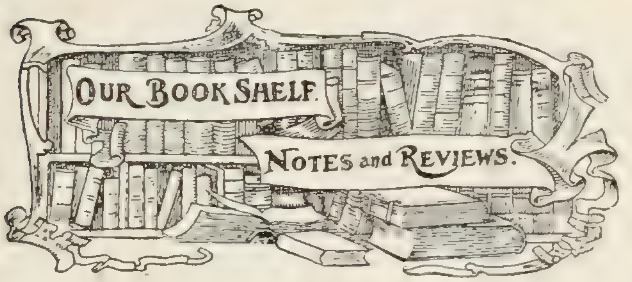
The cultivation and manufacture of cotton is one of the most important industries of China. It is generally conceded that the area devoted to the cultivation of cotton is only exceeded by that planted in silk and tea. The country adjacent to Shanghai is the principal cotton-producing district in China for bulk and grade, the staple being about 23·5 millimetres (0·93 inch) in length. Hankow and Ningpo are also important centres, but the quality is inferior to that grown in the Shanghai district, the staple measuring only about 20 millimetres (0·78 inch).

Of the cotton exported, Japan takes about 90 per cent. The native staple, being short and unsuited to the machines in use in American mills, is not expected to compete with the American product for spinning. It is, however, well adapted for filling and short-end work, such as the manufacture of rugs, carpets, curtains, etc., and this is the market it is hoped to secure. That exported to Great Britain, Germany and Italy is used principally for such work, and there is an increasing demand for it in those countries. The total exports of raw cotton in 1907 amounted to 131,707,731 lb., valued at $13,398,192, against 85,780,750 lb., valued at $6,724,250 in 1908. The Chinese customs valued the haikwan tael at 79 cents in 1907, and at 65 cents in 1908, which accounts for a proportionate share in the decreased value for 1908.

Most of the cotton is grown on small farms of 5 to 7 acres. The whole family engages itself in the cultivation, and works as many as twelve hours a day. If the work exceeds the capacity of the family, coolies are hired at 16c. per day. The implements used in the cultivation are of a rude type. The wooden frame plough, with an iron blade, is drawn by cows and buffalos. The hoe used corresponds to the American adze. The method used in raising water for irrigation is by a pump consisting of a string of cups, sometimes operated by animals. A rude sickle is used for cutting. Transportation about the fields is done on human backs, while the haul to the market is performed by wheelbarrow. Small ditches, fed by creeks, surround the fields for irrigation. The ground is broken twice a year, in spring and autumn. The plants grow to 6 or 7 feet in height, and the crop is gathered in September or October. About 60 per cent. of the cotton is manufactured by a native process. In the treaty ports, most of the cotton is sold to foreign manufacturers. (*Monthly Consular and Trade Reports*, November 1909.)

The Wild Ipecacuanha.

The late Mr. P L. Simmons, in his work on drugs, states that the root of wild ipecacuanha (*Asclepias curassavica*) comes from the West Indies and Tropical America. It is known as wild or bastard ipecac, and is used by the negroes as an emetic and purgative. From another source we learn that it abounds in the islands of St. Kitts and Nevis, W. I., where it is largely used as a medicine. Both the root and the expressed juice are emetic. Dr. Grain has found in *Asclepias curassavica* a glucoside, asclepiadin, which he believes to be a pure form of asclepiadin of Harnack and the asclepin of Feneulle, and closely to resemble emetine in its physiological action, but to be so unstable as to be of no practical value. Wild ipecac similar in character to the present consignment has occasionally been offered in auction, and has usually been sold as 'roots', at a few pence per pound, as nobody appears to have gone to the expense of having it analysed. That this wild ipecac is abundant needs no proof, but on account of its pale colour it is not so readily adaptable for the purposes of adulteration as some of the other spurious ipecacs. That it will eventually be used for this purpose goes without saying. In a consignment, an overland sample was sent in the first instance, and this was submitted to a broker, who pronounced the article to be 'roots' of no medicinal value. For this expression of opinion the broker was taken to task, it being remarked from Pernambuco that London knew nothing about the article, which as a fact was largely prescribed by doctors among the natives in South America. (*The Chemist and Druggist*, Vol. LXV, p. 733.)



THE BOOK OF THE GOAT. Fourth Edition. By H. S. Holmes Pegler. *L. Upcott Gill, London.*

The matter contained in this work was first published as a series of articles, in *The Bazaar, Exchange and Mart.* The author, who it may be mentioned, is the Honorary Secretary of the British Goat Society, was induced in the first instance to publish his experience on account of the large number of queries concerning goat-keeping that were continually received by the above-mentioned journal. After the material had run through two editions in book form, it was decided to revise it and bring it up to date for a third edition. This was done in 1885. Since then, a marked advance in goat-keeping has taken place, and the general literature on the subject has been considerably enlarged, so that it has become expedient to issue another edition (the fourth), and it is in the form of this that the book is at present under consideration.

Although the contents of the volume are not actually arranged in sections, they can be classified in order under the following heads: introduction (Chapter I); origin of the goat, and its varieties (Chapters II to IX); selection, breeding and rearing of goats (Chapters X to XV); the products and uses of the goat (Chapters XVI to XXIII); the goat at shows (Chapter XXIV); the British Goat Society (Chapter XXV); goats and disease (Chapters XXVI, XXVII); the removal and prevention of growth of horns (Chapter XXVIII). It is completed by the inclusion of a good index.

Taking these sections in order, the introduction makes suggestions for the more frequent keeping of goats by cottagers in England, and for the larger use of goats' milk. Attention is drawn to an interesting table which shows that, according to statistics, Spain is the largest goat-keeping country in Europe, while Germany, France, Italy, Russia, Greece and Austria come next, in order.

In the section which deals with the origin of the goat and its varieties, the first chapter (Chapter II) gives an interesting account of the early history of that animal, both from the geological and archaeological points of view. The succeeding chapters, having for their subject the varieties of the goat, contain carefully presented particulars of the characters of these, and the usefulness of the matter is increased by the inclusion of a number of good illustrations.

The chapters on selection, breeding and rearing treat of these important subjects in a very thorough manner. The contents are well arranged under sub-headings, and are presented with the certainty of one who is an authority in respect of the matter with which he is dealing. The sections on the buying of goats, the selection of breeds, housing, pasturing and feeding are worthy of special attention.

The greater part of the information given in connexion with the products yielded by the goat is naturally concerned with the milk. Careful attention is given to the subject of milking, and several interesting facts are adduced in relation to the milk yield of the goat. In comparing goat's milk with that from the cow, several points that are to the advantage of the former are brought forward, and it seems that the popularity of this would be much increased if the product were more often presented with more attention to cleanliness and care in milking. The other products that are considered are butter, cheese, flesh, hair, skins, horns and suet, and the way in which the facts concerning these are dealt with makes interesting reading.

Of the remainder of the book, that part which treats of the goat at shows is of the greatest interest to readers in the West Indies. The subject is presented both from the side of the exhibitor, and of the organizers of shows, and the portion which goes into the question of judging should be specially useful.

The book itself is produced in a handy and attractive form, and its contents form matter that can be read easily and with pleasure. The illustrations are good, and, altogether, the work can be recommended for perusal by all who are actively interested in the rearing of goats.

THE ILLUSTRATED POULTRY RECORD. Edited by E. T. Brown. *Brown, Dobson & Co., Ltd., London.*

As was stated in the introductory article of the first number, this is the first sixpenny monthly journal, connected with the poultry industry, to be published in England. The article went on further to say that the first aim of the journal is 'to help that industry along its upward path', and that it will be imperial in its sympathies 'in that poultry-breeding throughout the British Empire will always occupy a prominent place'.

Some idea of the scope of the journal is given by a consideration of its table of contents. After the introductory article and an account of the chief happenings of the month in the poultry world, there follows an interesting and useful series of leading articles, each written by a specialist in the subject with which it deals. Following an illustrated section which strikes a personal note in regard to some of those who are well known among persons specially interested in poultry in England, there are articles which treat of exhibitions, hints for amateurs, educational matters, poultry production, and marketing. The next sections are devoted to colonial news and foreign notes, and the journal is completed by four other sections which include hygiene and disease, clubs and societies, notes from correspondents, and an interesting supplement.

Most of the articles have a general interest to poultry keepers, no matter in what part of the world they may be read, for many of the main principles of poultry-raising have a world-wide application. They will be all the more acceptable in that they are written in a broad spirit and that they contain nothing that is merely dogmatic. The section in which colonial news appears has its special interest, and there would seem to be room for widening the scope of this by the provision of a larger number of direct contributions from the colonies themselves.

Accounts have appeared, from time to time, of the organization and working of the better known poultry clubs, and the descriptions of them are of interest. Added to this is the fact that such descriptions would be of great use in the event of its being deemed expedient to adopt similar organizations in the West Indies, and they contain matter for encouragement in that they often show what were the small beginnings from which many of those bodies sprung.

The way in which the journal is produced should be a source of satisfaction, both to those who have the work of its preparation and to those for whom it is designed. The size of its pages permits of the use of a readable type, and the quality of the paper on which it is printed gives the best facilities for the production of its many good illustrations.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

As was promised in the last issue, the subject of the Balance of Life in the Soil is continued in this number. The theme is concluded, in the editorial, in a broad way, which relates to the interests of the agriculturist.

An account of results that have been obtained in Porto Rico with seedling canes from the British West Indies, is given on page 35.

Accounts of interesting experiments with green dressings in Antigua and Dominica appear on page 37.

The Insect Notes, on page 42, contain two articles—one on the insect pests of Uganda, where a comparison with those in the West Indies is given, and the other supplying interesting information in connexion with the sweet potato weevil (*Cylas formicarius*). Acknowledgement is made to the United States Department of Agriculture for permission to use the block for Fig. 5.

The Fungus Notes (page 46) appear under the heading Cacao Diseases in Surinam. In the article, the expediency of the completion of the work in connexion with the correlation of some of the diseases of cacao is indicated.

A note on a grass (*Sporobolus indicus*) that is fairly common in the West Indies is given on page 46.

Manufacture of Tapioca in the Malay States.

Tapioca is stated to be produced in the Malay States from cassava starch in the following manner. The starch, while still wet, is made into small round pellets by pressing, rolling and shaking it, and forcing it through a sieve on to a piece of cloth which is kept in constant movement. The pellets then fall on to an iron plate, which is also kept shaking, and is heated to a temperature of about 100°C. The heat causes a partial conversion of the starch into dextrin, and swells the pellets, which becomes gelatinous in appearance. The product is called pearl tapioca. Pellets 1·15 millimetres in diameter form 'seed tapioca'; 3 millimetres in diameter, 'medium pearl'; 5 millimetres, 'bullet pearl'.

The amount of tapioca exported from the Federated Malay States during 1907 was 45,600 tons, of a value of about £720,000.

Uses of Cotton Waste.

Two kinds of material are included under the name of cotton waste; one of these is a thread waste which is used by those in charge of machinery and for packing purposes, and the other is a soft waste which is generally re-spun. The latter is often worked up into yarns which are used in the manufacture of cotton, or cotton and woollen, goods. Additional uses for this kind of waste are for making wadding, for upholstering purposes and for the manufacture of smokeless powder. To a much smaller extent it is used in cotton-tipped cigarettes.

In addition to that in the waste proper, a large trade is done in cotton linters, as well as in cotton pickings; these are composed of pieces of cotton which become detached in sampling and transportation, and which are sold at prices about 10 per cent. less than those of ordinary cotton.

Characteristics of Manicoba Rubber Trees.

In the last issue of the *Agricultural News,* a note was given on the variability that is shown by the Jequié rubber tree (*Manihot dichotoma*). In the *Agricultural Bulletin of the Federated Malay States,* November 1909, the main characteristics of this species, as well as those of the Remanso Maniçoba rubber tree (*Manihot piauhyensis*), are given. The leaves of the former are from 3-to 5-lobed, pale green on the under surface, with ribs of greenish white; the contrast of the ribs with the leaf is sufficiently well marked to render the species easy of identification. The height of the tree is said to become about 30 feet, and its diameter about 2 feet, when it reaches full maturity. The leaves of *Manihot piauhyensis* are 3-to 5-partite, that is to say the divisions between the parts are very deep; they are of a darker green colour than those of the former species. The ribs on the under side of the leaf are of a purplish colour. The plant is a small tree reaching a height of 6 to 16 feet.

A third species of rubber-yielding Manihot has been mentioned recently, namely the S. Francisco Maniçoba (*Manihot heptaphylla*). It is said to yield rubber of good quality.

The Cay-cay of Annam.

An account of the cay-cay of Annam (*Irvingia Oliveri*) is contained in a report of the Director of Agriculture, Forests and Commerce on the work of the experiment stations and botanic gardens of Indo-China for the year 1908. It states that investigations undertaken at the Agricultural and Industrial Laboratory of Saigon have shown that the kernels of the seeds of *Irvingia Oliveri* contain about 56 per cent. of a fatty matter which is edible and capable of replacing the oil obtained from copra in all its uses.

It appears, however, from several enquiries that this plant is not suitable for artificial planting, as information furnished by the Forestry Service of Cochin-China shows that the average crop produced by an adult tree only amounts to about 220lb. of fruit which contains about 45 lb. of seeds. The latter only contain about 18 to 20 per cent. of their weight of kernels, and the weight of useful matter is thus not more than 9lb. per tree.

On a basis of an extraction of 50 per cent., one tree could thus only furnish about $4\frac{1}{2}$ lb. of fatty matter. The cultivation of this plant, under these conditions, is not recommended, especially as its growth is slow, and it does not produce useful crops before the age of ten years. Another consideration is that, owing to the great ramification of the principal branches, no more than forty trees can be planted on each acre.

Euphorbia Latex for Preventing Corrosion.

In Newman's *Metallic Structures* an account is given of the use of the milky juice of the Euphorbias (spurges) for preventing corrosion. It is stated that it is only in comparatively recent years that the preserving qualities of Euphorbia latex have been made use of in engineering structures, and then only occasionally. A description is further given of the way in which this property was discovered. It appears that, during a surveying expedition in Natal, it was noticed that, when Euphorbia plants were cut by the clearing knives, the juice formed a layer on them which could only be removed with great difficulty. Further experiments with pieces of iron that had come into contact with the juice showed that these did not rust, and that when they were immersed in sea water, at Durban, they remained free from barnacles and were not affected by any form of marine life. In Natal, laths coated with Euphorbia latex, together with those which had not been so treated, were thrust into nests of the white ant (*Termes bellicosus*); after twenty-four hours, the treated laths were found to be unaffected, while those which had not come into contact with the juice were completely riddled by the insect. It is further stated that timber coated with Euphorbia latex remained untouched by the sea worm, *Teredo navalis*, and mention is made of the employment of the juice in making paint.

Since this, according to the *Agricultural Journal of the Cape of Good Hope*, as a result of enquiries on the part of the Somerset East Chamber of Commerce, it has been ascertained that the above statements regarding the preserving properties of the juice are correct, and that, although owing to its gummy nature it is no longer used in paints, it is employed by makers of compositions for ships' bottoms, and an attempt is being made to create an export trade in the article from Cape Colony.

Change of Habits by Birds.

Interesting notes on this subject appear in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for November 1909. It has long been observed that the habits of birds living in islands differ materially from those of birds from the same species which live on continents, and these differences are specially noticeable among insect-eating birds. An example is the carpenter bird, which is one of the woodpeckers, and therefore essentially an insect feeder; this has a close relative, the 'sap sucker', which feeds on the sap exuding from holes made by it in the trunks of trees. This habit of feeding seems to have been comparatively recently acquired, for one species, the yellowbellied sap sucker (*Sphyropicus varius*) is known to capture and devour such insects as may come within its reach.

The differences shown are probably due to the fact that the supplies of food are more likely to suffer a temporary interruption on islands than on continents, because the insect fauna of islands is generally comparatively poor, and because much more serious damage may be effected in islands by high winds and storms. It is quite probable, in such circumstances, that some of the birds will adopt, at any rate temporarily, the habit of eating kinds of food to which they have not been accustomed, but which may be sufficiently palatable to be edible. For example, a woodpecker searching for food among cacao trees and probably attempting to extract an insect from a cacao pod might easily be supposed to develop a sufficient taste for the pulp of the cacao bean to employ this as food during times of shortage of supply.

Orange Oil in Italy and Jamaica.

In Italy, after the Messina earthquake, it became speedily known that a very large part of the stocks of orange oil at that place and at Reggio had been destroyed, and it was thought that, as a consequence, there would be a great scarcity of sweet orange oil, and that prices would advance. Actually, the tendency of the market has been the opposite to this, and prices have been steadily falling. In the *Semi-Annual Report* issued by Messrs. Schimmel & Co. in October last, it is stated that careful investigations, undertaken for the purpose of finding an explanation of the circumstance, made it evident that a considerable industry in the manufacture of new oil had gradually arisen. The cause of this was that, owing to the repeated destruction of the railway track, the use of the line, as soon as it was repaired, for carrying supplies into the distressed regions, and the conversion of railway cars into dwellings for the destitute survivors, the export of oranges from Calabria was stopped, so that growers employed their fruit in the manufacture of essential oil, thus giving rise to a new source of supply.

INSECT NOTES.

UGANDA INSECT PESTS.

An interesting leaflet by Mr. C. C. Gowdey, B.Sc., recently received, gives a brief account of certain insect pests in Uganda, and as many of the crops there are similar to West Indian crops, readers of the *Agricultural News* may be interested in the following notes.

Cotton in Uganda is attacked by the larva of *Prodenia littoralis* in the same way as by the cotton worm (*Alabama* [Aletia] *argillacea*) in the West Indies, and the same remedies are used to control it. One of the cut worms in the West Indies is related to the cotton caterpillar (*Prodenia littoralis*).

The Uganda boll worm of cotton is the same as the Egyptian species (*Earias insulana*), although this is not the species known in the West Indies as the boll worm; its habits are identical, and the measures for its control would be similar.

The cotton stainer (*Dysdercus nigrofasciatus*) is closely related to the cotton stainers of the West Indies; it attacks the plant in the same way and would be controlled by the same means. The same species of Aphis, or plant louse, as that known commonly in this part of the world attacks cotton in Uganda

Mr. Gowdey states that, although he has not been able to find the boll-weevil (*Anthonomus grandis*) in Uganda, he has been informed that it occurs there.

The citrus trees of Uganda are attacked by several of the same species of scale insects as those in the West Indies, and in addition, oranges are affected by the larva of a large butterfly (*Papilio demolens*) which feeds on the leaves. In Cuba and Porto Rico, two species of *Papilio* are known to attack oranges in this way, but these insects are not on record as pests in the Lesser Antilles. The cacao thrips (*Heliothrips* [Physopus] *rubrocinctus*) occurs as a pest of cacao in Uganda, as well as the black scale (*Lecanium nigrum*). The latter occurs in the West Indies on hibiscus, cotton and other plants. It was a very severe pest on cotton in Barbados for some three or four years; but is at present very well controlled by its parasite, *Zalophothrix mirum*. *Lecanium nigrum* is not recorded as occuring on cacao in the West Indies.

Two beetles attack the leaves of the cacao; but no mention is made of a boring insect like our *Steirastoma depressum*. Tobacco is also attacked by two leaf-eating caterpillars. One of them is *Prodenia littoralis*, the cotton caterpillar of Uganda, and the other is *Protoparce carolina*, one of the tobacco-eating hawk moths known in this part of the world. Cut worms are also among the tobacco pests of Uganda.

Coffee is attacked by two species of scale insects, *Lecanium nigrum* and *Aspidiotus* sp., and by a beetle which lays its eggs in the developing flower. The grub feeds in the coffee bean, and pupates in the tunnel formed by its feeding. Attacked coffee beans have a shrivelled appearance, and are unfit for consumption.

Funtumia rubber is attacked by *Lecanium viride*, which was a serious coffee pest in Ceylon, and which during the past few years has been much in evidence as a pest of limes in the West Indies. Castilloa rubber is attacked by a long-horned borer (*Inesidia leprosa*) which, in Egypt, is a borer of the woman's tongue tree (*Albizzia Lebbek*). The sweet potato weevil (*Cylas formicarius*) occurs as a pest in Uganda, and a sweet potato caterpillar is mentioned, which feeds on the leaves. The name is not given but it may be nearly related to our West Indian potato hawk moth (*Protoparce cingulata*). Palms in Uganda are attacked by many of the same species of scale insects as in the West Indies and by a weevil, *Rhyncophorus phoenicis*, which is similar to the West Indian *Rhyncophorus palmarum*.

Many of the miscellaneous pests are the same in Uganda as in the West Indies, or are very nearly related. Among these are grasshoppers, plant-lice, mole crickets, scale insects, flea beetles, and the pests of domestic animals, etc.

The white ants (Termites) are more abundant and more destructive in Uganda than in these small, and comparatively dry islands. Not only do they attack the dry wood in buildings, etc., and the dead wood in trees, but kill living trees. Many of the African termites are builders and their enormous mounds or nests are conspicuous features of the landscape.

The Sweet Potato Weevil. (*Cylas formicarius.*)

Specimens of a small beetle were recently received at the Head Office of the Imperial Department of Agriculture from British Guiana, and were believed to be *Cylas formicarius*, a pest of sweet potatos. This sweet potato weevil was mentioned in the article on the scarabee of the sweet potato in the *West Indian Bulletin*, Vol. X, No. 2, where the statement was made that the insect was known as a pest in the Southern United States and Jamaica. A few of the British Guiana specimens were sent to Professor W. Newell, Secretary of the Louisiana State crop pest commission, who states that they are the sweet potato weevil, *C. formicarius*, as believed, and that it has been recorded as being found in Barbados.

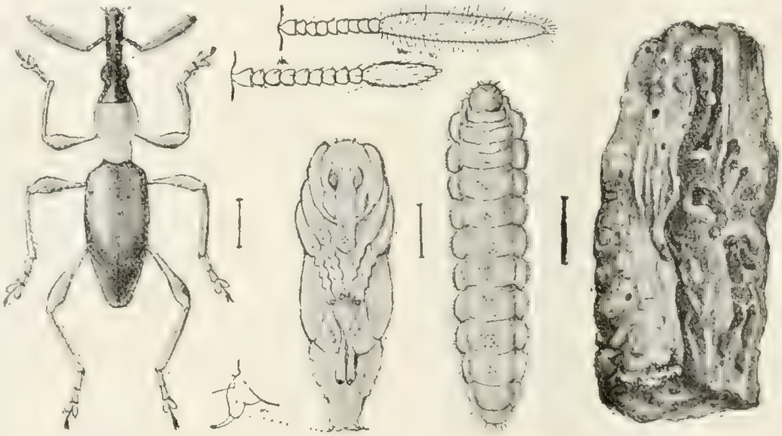

FIG. 19. SWEET POTATO WEEVIL. (*Cylas formicarius.*)

The sweet potato weevil which is abundant in Barbados is the scarabee (*Cryptorhynchus batatae*), and since the establishment of the Imperial Department of Agriculture, *Cylas formicarius* has never been reported in any of the Lesser Antilles

It might be stated that *Cylas formicarius* occurs in many far-distant parts of the world, in addition to the American localities already mentioned. One of these far-distant localities is mentioned in the preceding article on this page, Uganda Insect Pests, where it is stated that *Cylas formicarius* occurs as a pest of sweet potatos in that country.

THE LOSS OF PHOSPHATES FROM SOILS.

As is well known, the loss from the soil of those compounds which form the source of the phosphorus required by plants is constantly taking place. At the Agricultural Experiment Station of the University of Wisconsin, investigations are being made for the purpose of determining the extent to which this occurs under various methods of farming. So far, the conditions under which trials have been made are those of exhaustive cropping and of heavy manuring; an account of these may be found in *Research Bulletin* No. 2, of the above-mentioned Station.

The importance of a careful study of the loss of phosphates under cropping conditions cannot be overestimated. Unlike nitrogen, this element cannot be collected from an inexhaustible supply, and unlike potash, it is being constantly removed from the soil in ways which are impossible to prevent, with the present conditions of farm practice. Phosphorus is used in the growth of the grain and is sold from the farm. That portion of grain which goes into human food is probably lost beyond recovery, and that which goes into cattle feed is very frequently lost because of carelessness in handling manure.

EFFECT OF EXHAUSTIVE CROPPING. Nine pairs of samples have been studied from fields which have been very largely exhausted by forty to sixty years of cropping in grain or corn, with little or no manure. It is evident that the loss of phosphoric anhydride, under conditions of constant cropping and no return, is largely caused by the removal of the crops, and this may amount to 30 per cent. of the total quantity contained originally in the soil.

EFFECT OF HEAVY MANURING. The custom of using large amounts of manure on tobacco lands raises the question as to whether or not the soil retains the essential elements so applied in excess of that taken by the crop. This problem is one which cannot be settled by a few isolated experimental plots which have been under control for a long period of years, since the retention of these elements by the soil will undoubtedly vary with its different characters. It seemed, therefore, highly desirable to study this matter on a considerable number of fields where the practice of heavy manuring has been followed for a long period of years. Determinations have been made on sixteen fields, chiefly in Dane and Rock counties.

Of the sixteen fields, nine show a decrease, on analysis; six an increase, while one has remained constant. The average of the sixteen fields indicates a loss of 5·4 per cent. of that contained in the original virgin soil. It is evident, therefore, that in spite of the large additions of phosphoric anhydride in manure, there has been no increase in the soil itself, although the decrease is not so great as in the case of the exhausted soils.

When the amount of phosphoric anhydride added in manure is compared with that removed by crops, it is seen that, on the average, almost five times as much phosphoric anhydride has been added in manure as removed by crops.

The conclusions reached are as follows:—

(1) Crops from 9 exhausted fields account for 80 per cent. of the phosphoric anhydride lost from the soil of those fields.

(2) Crops from sixteen heavily manured fields account for 19 per cent. of the phosphoric anhydride lost from the soils of those fields.

(3) Heavy applications of manure in tobacco-cropping result in an enormous loss of phosphoric anhydride. In the sixteen fields examined this loss is equal to the total amount originally present in the soil.

POULTRY NOTES.

RHEUMATIC TROUBLES OF POULTRY.

The common title that is given to all cases of poultry losing the use of their legs is 'cramp', but this is not an accurate description, because there are various forms of leg trouble, and they do not all arise from the same cause. It is generally supposed that all cases of inability to stand arise from the same cause, that is to say, damp; but this is not the case. Fowls suffer mainly from four forms of muscular leg trouble. There is first of all cramp, as applied to chickens and ducklings. Now this may be due to damp, insanitary surroundings, but it may also be due to physical weakness arising from constitutional debility, and it is most commonly seen amongst chickens and ducklings hatched in the winte time when the egg germs are not so strong as they are at other times, and the cure for this is to adopt such a course of feeding as will strengthen the limbs and enable the frame to grow up strong. Should the trouble, however, arise from damp, then the cramp is rheumatic in its origin, and should be treated by warmth and by the use of some stimulating liniment. A great many of these cases of cramp amongst chickens and ducklings are due to their being kept on brick floors. It is no uncommon thing to find a farmer keeping ducks in a pigsty paved with a brick floor, which is of course about the worst possible thing for them. Such a floor should be covered with boards, and on the top of the boards should be put 2 or 3 inches of peat moss litter or dust, and then they would be perfectly warm and dry, and there need be no fear of cramp. Similarly with chickens, cramp often results from cold, damp floors, and it is far better to let chickens sleep on the bare ground than to put them to sleep on a cold brick floor, with perhaps a little straw littered over it.

Coming now to rheumatic trouble in older poultry, of course rheumatism is one of the recognized complaints to which poultry are liable, and if it is allowed to go on long enough it will degenerate into gout, because rheumatism is really due to a certain condition of the blood, which is induced by a particular course of feeding, and is encouraged by damp, unhealthy surroundings; and then the acids which form in the blood as a result are liable to concentrate themselves in the joints, and you get swollen joints in birds, just as you do in human beings. As a rule, however, the life of a fowl is not long enough to enable it to become gouty. Rheumatism, however, is fairly common, and the way to treat it is to use a stimulating preparation such as hartshorn and oil, or turpentine liniment or something of that kind, to the shank of the leg, and to give the bird a dose of quinine or some similar tonic. But there is one form of leg weakness which is not rheumatic, and which only affects laying hens, particularly young hens during their first season. This is what is known as ovarian cramp, and it is a muscular affection caused by the strain of laying, which seems to deprive them of the use of their legs. A young hen will often be found squatting down on the nest unable to move after laying, and if she be lifted off she will flutter across the yard, and seem to have lost control over her legs. All she needs is to have a little rest for a few hours, when these symptoms will disappear; but it is a wise plan in such a case to keep the bird on short rations in order, if possible, to check the development of eggs, because it is obviously desirable that laying should cease until the muscles have recovered their normal condition. (*Farmer and Stock Breeder.*)

GLEANINGS.

The amount of cotton produced in Togo, French West Africa, in 1908, was 423 tons, as compared with 301 tons in 1907.

Unginned and ginned cotton to the value of £6,670 and £7,117, respectively, were shipped from the Uganda Protectorate during the quarter ending September 30, 1909.

The quantity of copra exported from Java during 1908 was nearly 95,000 tons, which is the largest amount since 1905. The quality is stated to have been generally poor, and prices fluctuated considerably, the lowest being 13*s.* 4*d.*, and the highest £1 3*s.* 4*d.* per picul (136 lb.).

It is stated in the *Report on the Agricultural Department of the Gold Coast* for 1908 that that Department had introduced improved varieties of sugar-cane from the West Indies, and that these varieties appeared to do fully as well as any of the native ones.

A text-book entitled *Practical School Gardening*, by P. Elford and Samuel Heaton, has just been issued by the Clarendon Press, at the price of two shillings. It contains a highly suggestive chapter on 'Discovery Lessons', the contents of which are of general interest in relation to nature teaching.

The degree of Bachelor of Science in Agriculture has been recently constituted at the Manchester University. The final examination for this degree includes the following subjects: agriculture and estate management, engineering and surveying, agricultural chemistry, botany and zoology, geology, economics, and agricultural law.

The *Annual Report of the Comptroller of Customs*, British Guiana, for 1908-9, shows that the value of the total exports of the colony for that period was $10,100,047; this is an increase of $1,884,639, or 18·6 per cent., compared with that of the previous year. Seventy per cent. of the total exports was formed by sugar, rum, molasses and cattle food.

An attempt is being made in St. Helena to develop a fibre industry, and the year 1908 was the first period at which the fibre exported actually affected the trade returns. The output of fibre and tow during the year attained a value of £3,557. The fibre produced is that of New Zealand flax (*Phormium tenax*).

A review has been received of a booklet entitled *Sanitary Methods in Dairies and Cowsheds*, by A. Melhuish, which is published by Messrs. Newton, Chambers & Co., Ltd., Thorncliffe, near Sheffield. The review would appear to show that the information contained in the work is specially applicable to cases where dairying is practised on a small scale

According to the *Board of Trade Journal* for November 25, 1909, 3,533,067 bales of cotton were imported into the United Kingdom during 1909, to November 18. Of this quantity 6,173 bales came from the British West Indies.

The report of the Curator of the Botanic Station, Montserrat, for November 1909, shows that work in connexion with cotton selection has been done at Dagenham, Richmond, Bethel and Brodricks, as well as on the plots at Grove Station. The number of plants selected was 15 at Dagenham, 16 at Bethel, 11 at Richmond and 6 at Brodricks, in addition to 70 plants in the plots at the Botanic Station.

The Annual Report of the Immigration Agent-General, British Guiana, gives interesting figures showing the develop- of the local rice industry that has been rendered practicable by the immigration of East Indians. The amount of rice imported annually, twenty years ago, was about 40 or 50 million pounds. During 1908, only 2 million pounds was imported, while there was an export of 7 million pounds.

An account of a new use for the Nicaraguan shade tree (*Gliricidia maculata*) is given in No. 61 of the *Bulletin of Agricultural Information*, Trinidad. It consists in cutting off such parts of the branches as may have grown sufficiently to extend below those of the cacao trees which it protects, and using them as a mulch. Such material should form a valuable addition to the matter that is available for mulching in cacao orchards.

A paper in the *Comptes Rendus de l'Académie des Sciences*, Paris, No. 148, shows that superphosphates, when used as manure in spring or autumn, rapidly become less easily assimilated, owing to the formation of basic phosphates. In soils rich in humus, however, the process does not take place to the same extent, because part of the phosphoric acid is fixed by the organic matter. Experiments conducted by the author show that the best results were obtained by mixing the superphosphate with an organic manure previous to its application.

During 1908, cotton to the value of £15,000 was exported from Porto Rico. The amount of cotton grown was double that of the preceding year chiefly on account of the freedom of the crop from caterpillars. Similarly, the value of the year's export of pine-apples was more than double that of 1907; it reached £56,454. There was a large decrease in that of coffee, amounting to £80,920. This is due to the removal of protection from this product, and its consequent competition on level terms with that from Brazil.

The Second International Food Congress, which was held in Paris during last October, was devoted to obtaining definitions of the operations which may be permitted in the manufacture of substances intended for consumption as food. Much attention was given to cocoa and chocolate, and there was a great difference of opinion between small and large producers as to the use of alkalis in preparing cocoa. It was finally resolved that the use of alkalis should be tolerated in cocoa manufacture for the present, but that a decision should be obtained eventually from an International Commission on the subject.

STUDENTS' CORNER.

FEBRUARY.

FIRST PERIOD.

Seasonal Notes.

Where cacao is being grown, read up the subject of cacao grafting; in doing this, reference should be made to Pamphlet No. 61 of the Department, entitled *The Grafting of Cacao*, as well as to what has appeared from time to time in the other publications; special mention may be made of the *West Indian Bulletin*, Vol. VIII, p. 137, and of the *Agricultural News*, Vol. VIII, p. 313. Satisfy yourself that certain advantages are gained, in regard to special plants, by the practice of grafting, and make yourself familiar with the circumstances in which these advantages consist. Consider what part of the stem has an intimate use in connexion with grafting, and try to give a reason why this operation cannot be practised with certain plants, and why, where it is possible, this is only the case where the plants are of either the same kind or closely related to one another. What effects may be shown by grafting (1) on the stock, (2) on the scion? In suitable weather, make actual practice of grafting, where it is possible for this to be done. What is the essential difference between grafting and budding, and why is the former recommended for some plants and the latter for others? What are the chief causes of unsuccessful grafting and budding?

In some of the cotton fields, it may be noticed that many of the leaves fall before their time, leaving the plants with many bolls that are still to open. An examination of such leaves will probably disclose the fact that the mycelium of a fungus is present on the under side of the leaf; the presence of this fungus is possibly the cause of its premature falling. In what ways may the fungus be enabled to gain access to the interior of the leaf? What is most likely to become of the fungus after the leaf is dead? Study the life-history of the fungi, and obtain a clear account of those which attack the different parts of the cotton plant. (Pamphlet 45, *ABC of Cotton Planting*; *West Indian Bulletin*, Vol. IV, p. 255; Vol. V, p. 178; Vol. VI, p. 117; Vol. IX, p. 216; *Agricultural News*, Vol. VIII, pp. 251, 267 and 283.) In regard to the leaf-blister mite, it should be noticed that, where there has been an early attack by this pest, the chances of obtaining a second crop of cotton are lessened, as the plants become badly infested by it.

An examination should be made of the seed yielded by any particular cotton plant. It will be found that this exhibits great uniformity, so that it is natural to conclude that the lint borne by the plant is of uniform quality. This consistency in the matter of quality of yield makes the examination of cotton from different plants a simple undertaking, as the quality of the bulk can be determined from investigations of a few normal lint-bearing seeds.

Now that the cotton plants are in bearing, an opportunity is afforded for making observations as to what is the most useful and convenient type of plant, in regard to shape. It will be seen that a large proportion of the plants suffer a loss of yield through the development of low-lying, spreading branches, the bolls on which decay through being subjected to the unfavourable conditions on or near the ground. It is thus explained why, in seed selection, some account is taken of the shape of the plants which have been chosen to give the seed for examination. Note that the bolls borne by different plants show variation in size. This variation is sometimes sufficiently great to make one type require fifty more bolls than another in order to provide a quantity of cotton weighing a pound. Examine the lint from bolls from various sizes; it will be found that small bolls do not necessarily contain seeds yielding short lint. An interesting observation may be made, where both selected and unselected cotton are grown, by examining seed from the two kinds in order to determine the proportion of clean black seeds in each case.

In places where a large number of cane cuttings that have been planted have failed to sprout, dig up several of them and ascertain, as far as possible, the cause of death. Make observations, also, with a view to determining if the cuttings were pushed to the bottom of the hole in which they were planted. If the cuttings in different fields have been treated differently before planting—that is to say if some have been treated with Bordeaux mixture and some with lime-water—make counts for the purpose of finding the percentages of failure in the two cases. A sufficient number of observations of this kind should give useful information as to the relative efficiency of the two methods of disinfection.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give a short account of the structure of the foot of the horse.

(2) Describe carefully the true stem of arrowroot and of ginger.

(3) Give a careful description, with sketches, of the growth of a cane 'top' or of a cane cutting.

INTERMEDIATE QUESTIONS.

(1) What do you understand by mulching? Describe several methods of mulching, and state what advantages are derived from the operation.

(2) State what varieties of cacao are recognized by you. Which variety is most suitable for the district in which you live, and why?

(3) How would you cultivate the soil in an old lime orchard?

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned from an official visit to the Northern Islands, by the SS. 'Oruro', on January 30, 1910. During part of the time, Dr. Watts accompanied the party of planters and others from Barbados who were visiting Antigua in order to gain information concerning the equipment and working of the sugar factories in that island, and to enquire into methods of implemental tillage, as well as for other purposes connected with the interests of agriculture.

Mr. Austin H. Kirby, B.A., of St. John's College, Cambridge, Agricultural and Science Master, Antigua, has been approved by the Secretary of State for the Colonies for the appointment of Scientific Assistant on the Staff of the Imperial Department of Agriculture in the West Indies, in succession to Mr. W. Biffen, B.Sc., who has resigned on account of ill health.

FUNGUS NOTES.

CACAO DISEASES IN SURINAM.

Two extremely interesting bulletins, numbers 20 and 21 have recently been issued by the Department of Agriculture in Surinam, dealing with diseases of cacao in that colony. The main results are summarized in English, and it is from the summaries that the following notes have been taken.

CANKER OR RED ROT DISEASE. The external symptoms of this disease agree very closely with those described for the stem and branch diseases of a similar nature which occur in Ceylon, Java, the Antilles and the Cameroons. Consequently it seems probable that the disease is the same in all these countries. Mr. A. E. van Hall finds that the disease in Surinam is due to a new species of *Spicaria*, which has been named *Spicaria colorans*, and that a species of *Nectria*, very probably *Nectria striatospora*, which is frequently found on diseased trees, is only a harmless saprophyte, and cannot be regarded as being in any way the cause of the disease. This is a conclusion of considerable interest to cacao growers in the West Indies, as the canker disease found here has always been attributed to two species of *Nectria*—*Nectria theobromae*, and *Calonectria flavida*. But, as Mr. van Hall remarks, the parasitic nature of these fungi is not yet certain, and their life-histories have not been fully worked out. The disease in Ceylon and also in the Cameroons has always been attributed to species of *Nectria*, but in both cases conclusive evidence is wanting; it is therefore extremely probable that all these fungi are only saprophytes, and that the true cause in each case is really the fungus *Spicaria colorans* to which the disease is due in Surinam. This last fungus produces spores of a *Fusarium* form, as well as the *Spicaria* form; but no perithecia, or any other higher form of fructification were ever formed in the artificial cultures. After carefully sifting the evidence, Mr. van Hall comes to the further conclusion: 'Up till now, there are no data which prove, or even make it likely that the canker disease may attack the pods', though, as will probably be remembered, species of *Nectria* have been reported as causing pod diseases in Ceylon and elsewhere. These conclusions serve to indicate very clearly that the true cause of 'canker' disease of cacao in these islands, and the full life-histories of the fungi *Nectria theobromae*, and *Calonectria flavida* are points which still require very thorough and critical investigation. The same is true of the diseases of cacao pods. One other point of interest also arises in this connexion. Owing to the semi-saprophytic character of the fungi belonging to the genus *Nectria*, it has always been thought that canker disease originated in wounds inflicted on the bark. Should, however, the disease prove to be due to *Spicaria colorans*, as in Surinam, there seems to be no special reason why infection may not prove to be direct, which would probably render the disease more difficult to prevent, though it would not alter the remedial measures which should be adopted, once it has obtained a footing.

DIE-BACK AND BROWN ROT. These two diseases are caused by the same fungus, which appears to be *Diplodia cacaoicola*, the fungus responsible for the same diseases in these islands. It was originally thought that the Surinam disease was due to an allied genus, *Chaetodiplodia*, which was separated from that of *Diplodia* on the ground that its pycnidia were hairy while those of *Diplodia* were smooth. This difference, however, was found to be due entirely to surrounding conditions and was not constant, for which reason Messrs. van Hall and Drost suggest that the former genus should be annulled. On some branches and pods the pycnidia appear in groups. This is a constant feature of the stem form of the disease in these islands, and is the character upon which the genus *Lasiodiplodia* was separated from *Diplodia*. This character also was found not to be constant in Surinam, and the Mycologist to this Department has observed the same thing to be true of specimens from these islands. In consequence, it is suggested that the genus *Lasiodiplodia* must also be abolished.

It is further worthy of note that, for the same reason, the two fungi *Diplodia cocaoicola*, causing die-back and brown rot diseases, and that alluded to in the publications of the Imperial Department of Agriculture as *Lasiodiplodia* sp., should be regarded as one and the same fungus. Infection experiments have not been undertaken here yet to prove this, but the conclusion seems fairly reliable and has been suggested independently by two French mycologists—Messrs Griffon and Maublanc. These observers, however, suggest a different system of nomenclature, so that at present the ultimate name of this fungus is in doubt.

It is found in Surinam that the die-back disease only affects trees that are in a leafless, or nearly leafless condition, owing to thrips, wind effects, or sudden removal of shade. In fact, as has been recognized here, the fungus is only a facultative parasite. It does not attack healthy pods, either, but only those that have been injured, or affected by other fungi. In this connexion, evidence is accumulating which tends to show that several other fungi are possibly responsible for pod diseases in the first instance; that is, they are capable of attacking injured pods directly, and after the pods have been weakened in this way, the brown rot fungus can obtain a hold. It is possible that two or three species of *Colletotrichum* may be responsible for this direct attack, as members of this genus are often found on cacao pods, and many of the species are known to be vigorous parasites on several different plants; an example is that causing cotton anthracose, and another causing the witches' broom disease of cacao in Surinam.

The remedial measures suggested are practically identical with those recommended for the same disease by the Imperial Department of Agriculture, and need not be repeated here.

Some of the points mentioned above are of a distinctly new nature and tend to overthrow some of the generally accepted ideas in connexion with cacao diseases. It is a peculiar fact that, in spite of at least ten years' work on the subject in many parts of the tropical world, really reliable and critical information on the identification and life-histories of the fungi causing disease of cacao is only now coming to hand. Even now, much work, particularly on pod diseases and on the possible alternative host plants of *Diplodia cacaoicola* still remains to be done.

Sporobolus Indicus.

This grass is known in most of the British West Indian islands as 'hair grass' or 'bed grass.' In Martinique, it is called 'cabouya'; this name is also given there to *Sporobolus Jacquemontii*. In Guadeloupe, both *S. indicus* and *S. Jacquemontii* are known as 'mabouge,' while the former has the additional name 'malefoin.'

S. indicus is a widely distributed plant. It grows well in dry places, and when young, forms good forage for sheep and horses.

S. Jacquemontii is very closely related to *S. indicus*. It is not as widely distributed, however, seeming to be confined to Jamaica, Hayti and the French Islands. It has the same natural habitat as *S. indicus*, but is not as abundant.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of December :—

Throughout the month of December, as is generally the case, the markets have shown the usual dullness, buyers being interested only in purchases to meet their immediate wants, and this dullness has been accentuated by the approach of the Christmas holidays, and the unsettled condition of the country consequent upon the advent of the general election, which in the present instance, at the time of writing, is having a more than ordinary disorganizing effect. In the drug market the two articles that have attracted the most attention of late, have been glycerine and Cascara Sagrada. The enormous rise in the price of the first is said to be due to the great demand at present existing for it in the manufacture of dynamite, which is now so generally used for blasting purposes, in the place of gunpowder. Cascara, however, is beginning to show an easier tone. The following are the details relating to West Indian produce :—

GINGER.

At the spice sale on the first of the month, 154 barrels of Jamaica were offered, but none sold, the whole consignment being bought in; 309 packages of Cochin and Calicut were also offered without reserve, and 100 sold at 81*s*. for rather small cut, an intermediate quality fetching 67*s*., and small native 52*s*.; 36*s*. to 37*s*. was paid for part lean, brown rough Calicut. In the following week there was no Jamaica offered, but there was a good supply of Cochin, amounting to 235 bags of washed rough, all of which was bought in at 42*s*. 6*d*. per cwt. Japan was represented by 374 bags, the whole of which was disposed of without reserve at 32*s*. 6*d*. to 33*s*. per cwt for wormy limed. About 30 cases of good brown Colicut were sold privately. At the auction on the 15th, the only offerings were 304 bags of limed Japan, the whole being sold without reserve, one lot of fair to good fetching 36*s*. 6*d*. to 37*s*. 6*d*., and another lot 38*s*. per cwt. There were no further quotations during the month.

MACE AND PIMENTO.

At the spice sale on the 1st of the month, 72 packages of West Indian mace were sold at the following rates: fair to good pale 1*s*. 9*d*. to 2*s*. 3*d*., pale and reddish 1*s*. 7*d*. to 1*s*. 8*d*., fair red 1*s*. 6*d*. to 1*s*. 7*d*., and pickings 1*s*. 3*d*. No change in this article has been made during the rest of the month. Pimento has received but little attention. At the first spice sale none was offered, but it was stated that 2½*d*. per lb. was the price paid privately. A week later 51 bags were brought forward, and the whole bought in at the price already quoted.

SARSAPARILLA.

At the first drug auction on the 2nd of the month, the supplies were limited, with no demand. There was no Grey Jamaica offered; the offerings being as follows: native Jamaica 26 bales, Lima-Jamaica 6 bales, Guatemala 32 bales, Honduras 10 bales. For the 26 bales of native Jamaica 10*d*. to 1*s*. per lb. were the prices at which they were held; for the 6 bales of Lima-Jamaica 1*s*., Guatemala 9*d*., and Honduras 1*s*. 4*d*. per lb. A week later it was reported that 13 bales of grey Jamaica had arrived, but no further business was done in this article.

KOLA, TAMARINDS, LIME JUICE, ETC.

At the first sale 11 packages of kola were offered, and 5 sold; for 2 bags of small West Indian 2¾*d*. per lb. was paid, and 1 bag of good washed realized 3*d*. per lb. At the same sale Tamarinds were brought forward in considerable quantity, 16*s*. per cwt., in bond, being asked for Barbados, and it was stated that higher prices were to be expected. This same price, however, was again quoted at the auction on the 15th, while the price of Antigua was 12*s*. to 14*s*. per cwt., in bond, and 11*s*. 6*d*. for East Indian. On December 8, concentrated West Indian Lime juice was reported 'firm, with buyers at £17'. At the end of the month 236 packages of lime juice was reported to have arrived from Dominica, but there was very little demand for it, the quoted prices being from 11*d*. to 1*s*. per gallon. The same steamer brought 28 packages of oil of lime, the market price of which at the time is 1*s*. 6*d*. per lb.

THE TICK AND DISEASE.

The November issue of the *Annals of Tropical Medicine and Parasitology* contains the reports of the twenty-first expedition of the Liverpool School of Tropical Medicine. This expedition was made to Jamaica, by Professor R. Newstead and Dr. W. T. Prout, and the reports deal fully with the blood-sucking arthropoda generally. The conclusions arrived at concerning the relation of ticks to disease are as follows:—

1. That the tick responsible for the transmission of Texas fever is the so-called Texas fever tick (*Margaropus annulatus*, var. *australis*), though experimental proof is needed to confirm this in the island of Jamaica. 2. That ticks are most abundant during the dry season. 3. That ticks are dispersed from place to place chiefly by the host to which they are peculiar. 4. That rain, or temporary flooding with water does not destroy ticks or their eggs. 5. That a relatively large number of young ticks will hatch, and possibly survive, for longer periods in dirty pastures than in pastures which are free from weeds and scrub. 6. That ticks cannot survive indefinitely and reproduce their species without access to a host. 7. That all natural enemies of ticks should be encouraged in every possible way, and that fowls should be kept in all cattle pens. 8. That in all cases where it is practicable, the burning of pastures should not be carried out until the eighth week after the removal of all stock. 9. That tick-infested animals should be thoroughly sprayed or dipped regularly at intervals of five to eight weeks, or at less intervals if found necessary; local applications being of little use in the destruction of cattle ticks, though useful in destroying those species which infest the natural cavities of the horse and mule. 10. That the effort to destroy the ticks must be a united one; no half measures will serve; all must participate in the work. 11. That the evidence of those pen-keepers who have constantly waged war against this pest is that ticks, on their respective estates, are not nearly as troublesome as formerly. 12. That the island Government remove the duty from all materials used in spraying and dipping cattle.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, January 18, 1910; Messrs. E. A. DE PASS & Co., January 7, 1910.

ARROWROOT—No quotations.
BALATA—Sheet, 2/7; block, 2/3 per lb.
BEES-WAX—No quotations.
CACAO—Trinidad, 52/- to 65/- per cwt.; Grenada, 48/- to 54/- per cwt.; Jamaica, 47/- to 52/-.
COFFEE—Jamaica, 38/- to 120/-.
COPRA—West Indian, £26 10*s*. per ton.
COTTON—Fully Fine, 18½*d*.; Floridas, no quotations; St. Croix West Indian, no quotation.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 45/- to 49/- per cwt.; low middling to middling, 50/- to 54/-; good bright to fine, 55/- to 65/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, no quotations; concentrated, £18 to £18 10*s*.; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—No quotations.
PIMENTO—Common, 2¼*d*.; fair, 2$\frac{5}{16}$*d*.; good, 2⅜*d*. per lb.
RUBBER—Para, fine hard, 7/6, fine soft, 7/1; fine Peru, 7/4½ per lb.
RUM—Jamaica, 2/7 to 5/-.
SUGAR—Crystals, 16/- to 18/3; Muscovado, 13/3 to 15/-; Syrup, 13/6 to 14/6; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., January 7, 1910.

CACAO—Caracas, 11¼c. to 12c.; Grenada, 11c. to 11¼c.; Trinidad, 11½c. to 12c.; Jamaica, 9½c. to 10½c. per lb.
COCOA-NUTS—Jamaica, select, $24·00 to $25·00; culls, $15·00; Trinidad, select, $24·00 to $25·00; culls, $15·00 per M.
COFFEE—Jamaica, ordinary, 8¾c.; good ordinary, 9c. to 9¼c.; and washed, up to 11c. per lb.
GINGER—10¾c. to 13c. per lb.
GOAT SKINS—Jamaica, 63c.; Barbados, 52c. to 55c.; St. Thomas, St. Croix, St Kitts, 50c. to 51c. per lb.; Antigua, 52c. to 55c., dry flint.
GRAPE FRUIT—$1·75 to $3·00 per box.
LIMES—$3·75 per barrel.
MACE—34c. to 38c. per lb.
NUTMEGS—110's, 9¾c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 4·02c. per lb.; Muscovados, 89°, 3·52c.; Molasses, 89°, 3·27c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., January 22, 1910.

CACAO—Venezuelan, $12·40 per fanega; Trinidad, $11·50 to $11·75.
COCOA-NUT OIL—90c. per Imperial gallon, cask included.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·50 per 100 lb.
DHAL—$4·40 per 2-bushel bag.
ONIONS—$3·75 to $4·00 per 100 lb.
PEAS, SPLIT—$7·00 to $7·25 per bag.
POTATOS—English, $1·80 to $1·90 per 100 lb.
RICE—Yellow, $5·00 to $5·10; White, $5·00 to $5·10 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., January 31, 1910; Messrs. T. S. GARRAWAY & Co., January 31, 1910.

ARROWROOT—St. Vincent, $3·60 to $3·75 per 100 lb.
CACAO—$10·00 to $10·50 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb., scarce.
HAY—$1·20 per 100 lb., dull.
MANURES—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—Bunched, $5·00 per 100 lb.
PEAS, SPLIT—$6·25 to $6·50 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $1·60 to $2·17 per 160 lb.
RICE—Ballam, $4·20 to $4·60 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, December 24, 1909; Messrs. SANDBACH, PARKER & Co., January 21, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·25 to $8·50 per 200 lb.	$8·50 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
CACAO—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
CASSAVA—	$1·08	No quotation
CASSAVA STARCH—	$6·00 to $6·50 per barrel of 196 lb. Sales—scarce	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	13½c. to 13¾c. per lb.	15c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL—	$4·05 to $4·10 per bag of 168 lb.	$4·25 per bag of 168 lb.
Green Dhal	$5·50 to $5·75	——
EDDOS—	$1·68 per barrel	——
MOLASSES—Yellow	22c. to 25c.	——
ONIONS—Teneriffe	——	No quotation
Madeira	4c. to 4¾c. per lb.	No quotation
PEAS—Split	$6·50 to $6·60 per bag (210 lb.)	$6·50 per bag (210 lb.)
Marseilles	$4·00 to $4·25	$4·50
PLANTAINS—	20c. to 48c. per bunch	——
POTATOS—Nova Scotia	$2·50	$3·50
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	$1·44 per bag	——
RICE—Ballam	No quotation	$4·75
Creole	$4·00 to $4·10	$4·00 to $4·30
TANNIAS—	$2·40 per bag	——
YAMS—White	$2·40	——
Buck	$2·88 per bag	——
SUGAR—Dark crystals	$2·55 to $2·75	$2·60
Yellow	$2·90 to $3·00	$2·80 to $3·00
White	$3·70 to $3·80	$3·60 to $3·80
Molasses	$2·00	$2·00 to $2·30
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

Co-operation Between the Planter and his Advisers.

TWO causes have operated chiefly in bringing about the existence of agricultural departments; they may be described as the ameliorative and the protective. The first has its origin in the recognition of the possibility of effecting changes in the soil and in the plant that would result in the production of greater yields, either because these had become small on account of the exhaustion of the soil, or because circumstances arose which necessitated a greater output from a given area of it, if the particular cultivation was to continue to be profitable. The second has arisen in a more sudden, and often a more tragic, way. A pest has appeared, has not been observed until it has become well established, and its depredations have brought about serious loss, and then the trained specialist has been called in to devise methods to combat it: in other words, to cure the patient after the symptoms have become so alarming as to threaten his speedy decease. This aspect of affairs, by now, should have become a thing of the past, and it is the purpose of the present article to indicate the way in which such a desirable condition can be brought into existence.

The broad uses of an agricultural department are sufficiently shown by the two considerations that have just been brought forward. Its functions are essentially advisory, in the light of experimentation and the right application of the knowledge of the way in which natural occurrences have their existence. It must possess the means of making accurate observations, and of amplifying the results of academic research in such a way as to render them of practical utility. For these objects, any means by which its field of view can be extended, and through which the results of its work can be more efficiently recorded, is of the greatest value. It is evident that the best means to this end is supplied by the intelligent co-operation of those whom its work most nearly concerns—the members of the planting body.

The directions in which the energies of an agricultural department are expended are influenced by both external and internal stimuli. Of these, the former are the most important, for they bring about a reaction to surrounding conditions which cannot have any other result than to put into train work that is of

the most directly useful nature. Not less useful is that which is originated by the internal observations and experience of the department; indeed, such efforts are more than expedient. There is, however, a grave chance that, owing to want of co-operation on the part of the planter, this self-originated work may bear too great a proportion to the total amount of effort that is expended, with the result that the attitude of those for whom the department exists is likely to become one of apathy rather than sympathy. Thus does the efficiency of the work of the trained investigator depend primarily upon the readiness of the planter to give assistance of a nature that he alone can supply.

This lack of helpful suggestion from without is mainly responsible for the over-development of one phase of the duties of an agricultural advisory body; this phase is connected with its function of warning those for whom it exists against the adoption of methods that may result in harm, or against pests and diseases that show signs of being likely to effect damage. It is this which causes the oft-reiterated warnings of such a body almost to develop the quality of mere scares, in the mind of the planter, who gains an instinct to prevent himself from being affected by those very fears which should have been his, as an outcome of his own observations, and the realization of the presence of the enemy within his gates. The existence of such a condition shows that the advisers of the practical agriculturist are doing work of a kind which they should rarely be called upon to effect; they are stimulating the planter toward performing his part in the co-operation that should always exist between them and him, in order that he may ask for, and act upon, the advice which they are more than ready to give.

This attitude of the practical agriculturist is due partly to the fact of his having become accustomed to the presence of the efforts and labours of a department which is continually interesting itself in the current of agricultural affairs. This is not the sole cause, however. A dangerous, wide-spread fallacy exists, to the effect that the work of such an organization can be completed after a few years—that, after it has reduced the number of such pests as are amenable to that process until they are no longer dangerous, or at any rate, has devised means by which they may be kept in check whenever they show a tendency to assume serious proportions, and after it has laid down similar general rules for all the other branches of agricultural practice, the reasons for its continuation exist no longer, and its disbandment should be a matter of course. A little consideration will show that the very nature of the work that has just been shortly outlined precludes the possibility of its final completion, and that there will be always new pest-problems and the periodical occurrences of old ones, new crops, new methods and new agricultural practices which will require the regulating and co-ordinating influence of an advisory department.

Enough has been said to demonstrate how necessary and how valued is co-operation between the practical agriculturist and those whose chief duty is to give him advice and help. The next step is to indicate in what directions, and in what ways, that co-operation can be most usefully conducted. The first matter in regard to which the two may meet on common ground is that of observation. Here, the opportunities of the person whose work is continually performed on the estate are often superior to those of the experimenters whose duty it is to give him every assistance. The recognition, by the former, of such observation as part of his daily activity, and of the expediency of communicating its results, as speedily as may be, to those who are working for him, will do much toward increasing the efficiency of that co-operation which is so desirable

A second indispensable means to the same end must be a readiness on the part of the planter to adopt the measures that are advised in the special circumstances of the problem that is before him. It may be that these, as at first suggested, are of a preliminary nature, and intended more to indicate what modifications of a general method are required for the particular case which has presented itself, than to have the character of finality. This means that he must be ready to assist in work that is, for a time, of a purely experimental nature. Instances are not wanting, as is well shown by the contents of many of the reports of the Imperial Department of Agriculture, that such work has often been, and is being, readily done, to the benefit of the planter, and for the assistance of his advisers. What is wanted is the extension of this phase of co-operation, so that the benefit may be enlarged and the effectiveness of the work of the Department may be increased.

A third link in the bond of co-operation is the existence of a readiness, on the part of the agriculturist in receipt of advice, to communicate results. It often happens that, when a suggested course of treatment has met with success, the very state of satisfaction that has arisen from this circumstance has been the means of causing the remedy to be forgotten, to the loss both of the planting community and of its advisers. Another matter of omission is that, even where a certain amount of information as to results is given, this is often of a very inadequate nature, in that it merely indicates whether a certain course of action has been

successful, or otherwise: no idea is given as to the effect of any attendant circumstances in bringing about a modification of the conditions under which it was supposed to have its influence. Thus much of the interest of the investigation is lost, and valuable information as to its relation to the special circumstances is rendered unavailable.

If these three phases in the co-operation between the planter and those whose work is undertaken in his interest are to be developed to the stage of their largest efficiency, they must not be evident solely in the times of fear induced by the presence of untoward conditions. They must become matters in the daily *routine* of estate work. Only then will that co-operation be of the greatest individual and collective value.

SUGAR INDUSTRY.

SUGAR CULTIVATION IN PERU.

A paper on this subject has recently been communicated to the *Journal d'Agriculture Tropicale* by M. César Broggi, the Director of the Sugar Station at Lima. In view of its general interest in sugar-growing countries, the following abstract of it has been made:—

It is only within the last forty years that the sugar industry has undergone a real development in Peru—a growth which was assisted by the good prices that were received for sugar in 1890. At present, the following products are obtained from the juice of the cane: (1) sugar for export; (2) white sugar for local use; (3) 'chancacas', or moist sugars in prismatic lumps, of several qualities; (4) alcohol and rum, by distillation; (5) a native drink called 'chicha'. The larger part of the sugar that is made is exported.

The cane is cultivated in the warmest parts of the country: near the coast in the sheltered valleys of the Sierra and in the midst of the mountainous region. The climate of the chief sugar-growing districts is almost temperate, and kept equable by constant winds, so that, in any given place, it does not depend much on the latitude.

The largest sugar works are situated in the district of Chicama, where some of them have an output of about 16,000 tons of sugar for export per annum. According to official statistics, the output of sugar from Peru, in 1907, was 108,403 tons. The amount consumed in the country itself was 21,068 tons, which brings the total production for the year to 129,471 tons, a quantity which does not include 8,897 tons of 'chancaca' utilized on the spot. Of alcohol, 176,000 gallons was distilled, of which 23,848 was exported. There are practically no importations of alcohol into Peru. The area devoted to cane-growing is 22,000 acres. It would appear that the exports of these products increased largely during 1908, though there are no figures available to demonstrate this fact.

For the purpose of preparing the soil, Fowler's steam ploughs, with four shares, are employed throughout the coast region. They are always followed by a harrow, and the soil is pulverized by means of a roller. After ploughing, the trenches for planting and for irrigation and drainage are opened. In order to simplify this part of the work, the land is divided into sections about 300 by 150 feet in area, separated by roads 12 to 25 feet wide, between which are laid out paths 9 to 15 feet wide. The lines of the trenches are traced by means of a small wooden ploughs, at a distance apart of 3 to 5 feet, according to the estate on which the cultivation is being carried out; for the purpose of deepening these, a double mould-board plough, or 'cajon', is used. The large drainage trenches run parallel to the roads, while the irrigation canals take the direction of the paths. These are made by means of the 'campa', which is a kind of shovel drawn by oxen; this serves also to make the smaller trenches which occur at every third, fifth or tenth row, according to the slope of the land and the local custom.

The planting material most generally consists of nothing but cane tops, or 'cogollos', which are chosen from the healthiest canes when they are being cut. In putting these in, care is taken to allow the upper part to project from the soil—a precaution that would not be required in the case of cuttings. The length of the tops employed for this purpose is about 16 inches. At the ends of the different sections of each row, two additional cane tops are planted, for the purpose of supplying dead holes at the end of the 'spring'.

The first weeding is done when the plants attain a height of about 1 foot; the rest succeed at irregular intervals, at such times as the weeds tend to overrun the land. The canes are moulded up, about five months after planting, by means of the 'cajon', described above, and advantage of this operation is often taken to make an application of manure. The latter generally consists of guano, together with the ash of the megass, or with sulphate of potash. The dressing is completed with lime and nitrate of soda, or potash; so far, green manuring is practised but little.

The cane fields on the coast lands are irrigated by means of canals containing a supply of water drawn from the rivers which flow from the Andes. In the winter season, only a certain amount of water is available for each planter, as the supply is limited during this part of the year. With rare exceptions, the amount of water at command during the summer is greater, and some of this could be saved for use during the drier season by the erection of expensive reservoirs. On the other hand, it is the want of water that prevents the extension of the cultivation. The application of water is effected by infiltration, submersion, or by means of weirs, according to the slope of the land. Some of the wetter soils are only irrigated once during the season, while for the drier ones, the operation is repeated as many as twenty-four times, the average number of irrigations not being more than five. Schemes for the improvement of the irrigation system are under consideration. The wet soils are drained by means of open trenches and, during the last two or three years, a commencement has been made with the adoption of pipe drains.

The periods of growth are: for plants, twenty to twenty-four months; for ratoons sixteen to twenty months. The canes are generally allowed to ratoon four or five times; in exceptional cases, tenth, twelfth, or even fifteenth ratoons are grown. Climatic conditions are such that the cane may be harvested at any time of the year; the rule is, however, to cease cutting for one or two months during the year, in order to provide time for necessary repairs to the sugar works. A native can cut four or five tons of cane per day.

The plant itself is subject to few diseases. Rats have not yet become the scourge that they are in several tropical countries. Among insects, borers are capable of doing much harm, but are effectively controlled by the selection of unattacked tops for planting.

It may be said, finally, that continual progress is being made by the sugar industry of Peru, and that this progress is materially assisted by the society of planters known as the 'Union Azucarera'.

WEST INDIAN FRUIT.

THE PROSPECTS OF VANILLA-GROWING.

Enquiries have recently been received by the Imperial Department of Agriculture as to the prospects of vanilla-growing in the West Indies, and the advisability of the extension of its cultivation. An increased demand has arisen in certain of the markets; by some, the reason for this is stated to be the recent passing of a pure food law in the United States. The chief competitor with vanilla is vanillin, which is artificially produced from eugenol, a constituent of oil of cloves. The pure food law, to which reference has just been made, makes it imperative, in relation to vanilla, that all packages containing artificial vanillin shall have a declaration to that effect on the wrapper or label, and it is explained in some quarters, that this has decreased the sale of this product in favour of that of vanilla. The Department has obtained definite opinions in regard to the prospects in the vanilla markets of London and New York; before giving these, it will be convenient to review the general position.

The following were the prices of vanilla on the London Market (Messrs. Dalton & Young) in July, September and November, 1909, as given in the *Journal d'Agriculture Tropicale*:—

SEYCHELLES.

Description.	July.	September.	November.
Fine (long)	12/- to 15/-	...	...
Fair	10/6	10/- to 11/-	...
Fair to good	8/- to 11/-	9/6 to 12/-	11/- to 15/-
Red and split	7/- to 8/-	..	10/6 to 11/6

MAURITIUS.

Description	July.	September.	November.
Good	12/- to 15/-	...	...
Fair (long)	10/- to 10/6	...	...
Ordinary (long)	8/3 to 9/-	..	...
Fair to good	9/- to 11/6	...	...
Ordinary (short)	7/6 to 8/9	...	...
Fair (short)	8/6 to 9/-	...	...

The remarks in connexion with the above were as follows:

July 1909.—'Demand good.' (*Journal d'Agriculture Tropicale*, No. 97.)

September.—'Only 108 boxes were offered. There has, however, been a large demand for the article, and the prices realized are higher by 6*d.* to 2*s.* per lb. than those of last month.' (*Journal d'Agriculture Tropicale*, No. 99.)

November.—'There was an extremely poor supply, amounting to 138 boxes. The demand was good, and the whole lot was sold at 1*s.* 6*d.* to 2*s.* 6*d.* above the ordinary prices.' (*Journal d'Agriculture Tropicale*, No. 101.)

An interesting article entitled 'La Vanille des Colonies Françaises et la Vanilline Chemique' appears in *l'Agriculture Pratique des Pays Chauds* for October 1909. In this, it is pointed out that, next to Mexico, the French colonies have become the most important exporters of vanilla. The production of this substance is, however, becoming a matter of greater difficulty year by year, owing to the lowering of prices that has been brought about by the competition of the artificial product, vanillin.

The following table, showing the quantity of vanilla exported from the French colonies, as well as from other parts of the world, in 1901, 1904, and 1908, is taken from the article mentioned:—

Source.	1901, kilos.	1904, kilos.	1908, kilos.
Tahiti	92,398	134,405	173,411
Madagascar	7,019	9,289	57,285
Martinique	226	317	1,806
Mayotte and its dependencies	1,364	76,094	69,867
Guadeloupe	2,591	8,657	30,954
Mexico (July to June)	25,588	98,334	108,071
Seychelles	71,899	41,072	24,776

The re-exports from France to various countries are also given; from this information, the following is abstracted:—

Exported to—	1901, kilos.	1904, kilos.	1908, kilos.
England	...	69,783*	37,971
United States	113,015	249,793	259,620
Germany	40,200	71,900	90,300†
Italy	4,500	7,205	78,961
Austria-Hungary	10,700	16,800	24,200
Belgium	4,110	6,893	7,436

Taken altogether, the figures show that the general production and consumption of vanilla are decidedly increasing.

Toward the end of the article, the following statement is made: 'Up to the present, the large quantities of vanilla produced in the different countries—quantities which have varied between 500 and 600 tons per annum—have always found buyers. Overproduction, in the true sense of the word, has thus not taken place, since there are not at present large stocks in hand. But it may be stated definitely, that there is, on one hand, a too abundant production of vanilla, and, on the other hand, this is concurring with a large manufacture of vanillin. This forms an explanation of the low prices that have just been under consideration.

Reference is made to the American Pure Food Law, 'which compels the makers of commodities for consumption

*In 1905.
†In 1907.

to indicate, in a plain manner, whether their products are perfumed with vanilla or vanillin.'

It is interesting to note, in passing, that the following measures are proposed for the purpose of putting prices in the French vanilla market on the most satisfactory basis:—

(1) A tax of 416 francs per kilogramme (about £7 10*s.* per ℔.) on vanillin.

(2) Application of the adulteration laws to vanillin.

(3) Reduction of the areas cultivated in vanilla in the different countries where it is produced.

The last recommendation is of special interest, in view of any proposal to extend the production of vanilla in the West Indies.

Evidence as to the increased production of vanilla is also given in the *Diplomatic and Consular Reports*, No. 4,243, Annual Series, *Report for the Year 1908 on the Trade of Réunion*. Here it is stated that the quantities produced in recent years were as follows:—

Year.	Kilos.
1906-7	35,588
1907-8	48,865
1908-9	70,000

It is further stated that, of the last crop, 44 tons was exported up to February 26, 1909, when prices varied between 6*s.* 4*d.* and 9*s.* per ℔, for first quality, and 3*s.* 2*d.* and 4*s.* 9*d.* for inferior quality. The final opinion given is: 'there has been a great overproduction of vanilla during the last five or six years, and prices are likely to go still lower as new plantations come into bearing.'

The 'Semi-Annual Report' of Schimmel & Co., dated October, 1909; has the following:

The French Government has received a memorial containing 2,500 signatures, from vanilla planters in the French colonies, urging the imposition of a sufficient excise duty upon vanillin to enable the vanilla-producers, who describe themselves as struggling for their existence, to compete successfully with the artificial scent. As a result of this step, it is intended to ask the French Parliament to sanction an increase in the import duty on vanillin to 15 francs per kilo (5*s.* 5*d.* per ℔.), in addition to an excise duty of 60 francs per kilo (£1 1*s.* 8*d.* per ℔.). Six colonial Deputies, chiefly from Réunion, are agitating with great zeal for the adoption of the proposal, and it will be a matter of great interest to watch whether it will be carried into law, or whether the French industries which consume vanillin will successfully oppose a scheme under which, in future, they would be deprived of the advantage of being able to employ the most important odoriferous substance.

The report of Messrs. John Hadden & Co., Salisbury Square, E.C., for September 1909 (given in the *Agricultural Bulletin of the Federated Malay States*), mentions that the offerings of vanilla met a good demand; fine black sold particularly well, and even foxy red and split had improved in value.

A general consideration of the above figures and facts would appear to show that the only immediate danger of overproduction of vanilla exists in the French colonies; this is probably because nearly all the vanilla produced by them is marketed in France. The demand in the other markets seems to be fair to good.

As was stated above, enquiries were made in London and New York by the Department, with a view to ascertaining the position in those markets. In replying to the first, Mr. J. R. Jackson, F.L.S., sends a copy of a letter received by him from a Mincing Lane expert, to whom he applied for information, which runs as follows: 'The quantities of vanillas now offered on the London market are considerably less than was the case some years ago, and there is a good demand, at increasing values, for all that can be brought forward, so that I am inclined to think that considerably increased supplies would find a ready market at full rates. Of course the quality should approach that of the Bourbon [Réunion] or Seychelles varieties, and not be of the coarser type, such as Tahitis. If your friends could supply the right grades of vanillas, I have no doubt they would meet a ready sale, and at remunerative prices, and we might again see London the chief market for vanillas. In spite of the ever increasing demand for the synthetic vanillin crystals, the beans still hold their own.'

The enquiry in New York was made from Messrs. Gillespie Bros. & Co. Part of the letter of reply from this firm stands as follows:—

'We have interviewed the principal broker in vanillas, and also one of the largest users. Neither of them is inclined to attribute the present high price of vanillas entirely to the Pure Food Act, but rather to short crops and an increasing demand. The Pure Food Law has probably had some effect, but articles such as vanillin, which is a synthetic vanilla, is being used in as large quantities as ever, and its sale is not prohibited so long as the packages are clearly marked Vanillin.

'The broker advises us that there is always a ready sale for vanilla of good quality, but was unwilling to name any price as being obtainable for an article or quality with which he was not entirely familiar. He laid great stress upon the fact that the value of vanillas depended almost entirely upon the curing and packing, but, on the whole, was inclined to encourage planters to go in for the cultivation.

'The consumer, on the other hand, is not in favour of attempting to grow vanillas on a large scale in the West Indies. He says that he has himself several times tried to work up the trade in two or three of the islands, and that his experience is that there is not sufficient labour, or cheap enough labour, to enable the article to compete with the products of other countries. He admits that, on present prices, the vanilla could be grown with good profit in the West Indies, as prices are two or three times as high as were obtainable three years ago, but in his opinion there will be a large crop next year, and prices will adjust themselves. He points out that it takes three years before the vines will bear, and that as the present high prices have now been in force for two or three years, the older planters in the other islands, who planted immediately, have now got large new plantations just about to commence bearing, and it is for this reason that he expects a decline in the market.

'This particular buyer obtains practically all of his supplies from France, and tells us that, whereas in former days he used to be able to buy in London to good advantage, the fact that the Bourbon [Réunion] Island vanilla has to go to France, has resulted in making the French market more important than the London market, and that the Seychelles vanilla is now going there in consequence. In that market he is now paying from 36 to 40 francs per ℔. for vanillas which, three years ago, he bought for 12 to 15 francs per ℔. We mention these high figures to show you the impossibility of giving you any actual idea of probable prices, for we have seen vanillas here which are not quoted at more than \$2·50 per ℔. They are, of course, not Bourbon or Mexican vanillas, and are not well dried or well packed.'

These considerations serve to show the conditions in the different markets, and must be taken into account before, in any particular instance, the matter is discussed in relation to the agricultural aspect. They should be helpful in giving some idea of the purely commercial tenor of the subject.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 31, with reference to the sales of West Indian Sea Island cotton :—

A good business has been done in West Indian Sea Island cotton since our last report, and about 330 bags have been sold.

The sales are chiefly comprised of Montserrat and Nevis 18½*d.* to 19*d.*, St. Kitts 18*d.* to 20*d.*, St. Vincent 20*d.* to 21*d.*, Anguilla 18¼*d.*, with a few Barbados at 19*d.* to 20*d.*

Prices are fairly steady, but we notice that Carolina cotton is offering at rather easier rates from Charlestown, Fully Fine being now quoted at 17¾*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 29, is as follows:—

There was some demand throughout the week, on a basis of Fine 32c., and Fully Fine to Fine, off in preparation, at 30c., resulting in the above sales. The buying was partly for export, but principally on account of the northern mills.

The factors continue to hold for the following prices, viz., Extra Fine 35c., Fully Fine 34c., Fine 32c., but they show more disposition to sell, and would probably make some concession in price to dispose of quantity, having a large stock on hand.

There is a limited demand for planters' crop lots, which resulted in the sale of one small crop at 37c.

USES FOR COTTON SEED OIL.

The following extracts are taken from a paper published in the United States under the name *Cotton-seed Oil Magazine*. They show that cotton seed oil is continually becoming of greater importance, and that the number of possible uses for this product has by no means been exhausted.

It is well known that by far the larger part of all the salad oil sold in this country to-day is made from cotton seed oil. Cotton seed oil enters largely into medicinal preparations, and, in fact, wherever an edible oil is used, it is almost sure to be cotton seed oil. It is replacing lard to a remarkable extent for cooking and baking, not only in the large wholesale establishments, but in our homes and kitchens as well. Probably the most promising field for cotton seed oil is the oleomargarine industry, provided that that industry could free itself from the effects of adverse legislation.

According to statistics, the output of cotton seed oil for last year in this country was 1,200,000 barrels, for domestic consumption. Had our consumption of oleomargarine been even equal to that of the Principality of Holland, which has a population of a little over two million people, it would have required, on the present basis of formulae for making oleomargarine, 2,370,000 barrels to supply the domestic demand for oleomargarine alone, to say nothing of that for other purposes, which now takes probably about 1,000,000 barrels.

The writer was recently approached by a party in the East, who claims to have discovered a process of refining cotton seed oils, rendering them sweet and palatable, at what he states is a much lower cost than is possible with present methods. The information leads me to state, for the benefit of the cotton seed oil chemists, that if they could produce an oil which would be absolutely neutral in taste and smell, they would find a much larger market for this oil than they now do.

In the manufacture of oleomargarine, for instance, about 30 per cent. of cotton seed oil is used, and the only reason why more of it is not employed is that that is the largest amount that the product will stand without the oil disclosing itself, on account of the peculiar taste, which it seems hard to remove. For the manufacture of oleomargarine, a pure neutral oil is essential, and when this is discovered or produced, it will find a ready sale. Another item which may be of value to the cotton seed oil chemist is that if he could produce an edible oil without destroying the crude colour, or if he could make it of a red gold tint, it would open up an entirely new market, and would bring a good price.

It is well known that, at present, the refining of cotton-seed oil removes its colour, together with the objectionable taste; but if this taste could be removed and the colour left, I believe we should have a product which would revolutionize the industry of oleomargarine making, which industry is rapidly increasing, and will increase still faster whenever it can get the proper materials to produce it.

The Tapping of Assam Rubber Trees.

For the purpose of tapping Assam rubber, or Rambong trees (*Ficus elastica*), the use of a rotary pricker, in which the pins are such a distance apart that the latex which runs from the puncture joins that from those adjoining, is a more practical way of extracting the latex than the making of a cut with a knife. If the rubber which flows from the various punctures is pulled off directly it has coagulated, it will be found that the flow will occur again, and a second *crêpe*-like film of coagulated latex can be pulled off. The absence of wounds prevents the attacks of borers, and the trees can be again pricked after a short time has elapsed. When the flow from the puncture is too great to allow it to coagulate, and it runs down, it can be caught at the base of the tree. (*India-Rubber Journal*, September 1909.)

THE STATE OF THE BRAZIL RUBBER INDUSTRY.

The exports of Brazilian rubber for the year ending June 30, 1909, were almost exactly the same as those for the year ending June 30, 1907, and yet the value in the past year was about 120 per cent. of the value of the crop in 1906-7, and about 187 per cent. of the value of the exports in 1907-8. The entries in Brazil, as measured by those at Para, were 38,003 tons in 1906-7; 36,650 tons in 1907-8; and 38,065 tons in 1908-9. Of the shipments for the past year, 19,200 tons were for Europe, and 19,050 tons for the United States, the stock on hand therefore having been drawn upon to some extent. The visible supply of Para rubber at the beginning of the present season is placed at 3,132 tons, as compared with 4,634 tons at the same time the year before.

The value of the rubber shipped during the past year shows prices for the product which have been without precedent, the range of prices in the past two years being greater than that shown by a similar product in the same time within modern commercial history. In February 1908, rubber was quoted at about 66 cents per lb. In July 1909, before the crop season closed, prices were $2·10 per lb. High prices have been charged for the rubber since last November, but the prices did not go above $1·50 per lb. until the last two months of the year. It seems to be generally agreed that prices will remain high during the current season. In the first place, it is understood that certain interests have combined to maintain the price. In a general way, also, with products like rubber, which at present depends more or less upon supplies from forest sources, it requires about a year to readjust supplies to demand, after there has been an over-supply and a reaction which led to an under-supply. While there is a prospect of high prices for the immediate future, and probably for the current crop season, such high prices will doubtless stimulate production and lead to a reaction in the other direction, which is likely to bring very low prices another season.

The chief element in the situation, however, which is likely not only to lead to lower prices, but also is reasonably certain to bring about regularity in supplies, and therefore a more permanent range of prices, is the plantation rubber supply. The supply of rubber from plantations in the Far East during the current year is placed at 4,000 tons, by practically all authorities. The actual acreage in rubber plantations in the East, at present, is placed at from 520,000 to 600,000 acres. The rubber production from such plantations, as they come into bearing, is placed generally at about 1 ton of rubber to 10 acres of plantation. The immediate supply from this source—a supply to be fully realized in the course of three or four seasons—will unquestionably reach from 60,000 to 70,000 tons, or substantially the equivalent of the present world supply.

If the demand for rubber increases at the present rate, the world ought to be consuming in, say 1914, about 105,000 tons. What the total world production will be at that time is of course problematical, but it looks as though plantations would be producing more than enough to supply the world's markets. This supply will be reasonably regular, will be based upon a known cost price, and it is quite evident that there will be no occasion for the immense variations in price which have characterized the rubber market for the past two years, in a way not only to cause many losses to manufacturers, but also to embarass them in manufacturing for a market even near at hand.

The probability that plantation rubber will soon dominate the rubber market of the world as far as quantity is concerned, is commencing to be appreciated in Brazil, but as yet, few steps have been taken to avoid possible results in this line. Several of the State executives, in annual messages, have called the attention of their rubber-producers to the situation and its unfavourable possibilities, but practically no action has been taken with a view to combat plantation rubber on a plantation basis. It seems probable that instead of rubber groves being planted in Brazil, and the rubber tree being cultivated as it is grown in the Far East, the only result of the plantation movement in Brazil will be that new rubber forests will be opened up, and that the rubber business will be managed upon a more modern and less wasteful plan. (*Monthly Consular and Trade Reports*, December 1909.)

SUGAR IN BORDEAUX MIXTURE.

The *Experiment Station Record*, Vol. XXI, p. 151, contains abstracts of two papers on the making of Bordeaux mixture. In one of these, it is recommended that the copper sulphate solution be gently poured into the milk of lime, as this causes settling to take place much more slowly than when the mixture is made in any other way. It is further stated that the addition of sugar has a similar result, so that when stock solutions are used, it is of distinct advantage to employ that substance. The other paper deals with investigations in which varying quantities of sugar were added to the mixture, in glass cylinders, the amount of precipitation in the latter being afterwards measured day by day, when it was found that the rate at which the sediment collected was greatly lessened by the addition of sugar.

A further development of the idea is contained in an article in the *Cuba Review* for November last, which is as follows:—

'Cucasa', a soluble saccharate of copper with lime, is said to be coming into use in Europe in place of Bordeaux mixture. The new product yields a solution of copper that has all the fungicidal properties of Bordeaux mixture, but with the added advantages, it is claimed, of affording a clear solution in any dilution, and of keeping comparatively long. Being clear, it does not clog the nozzle of the spraying machine; furthermore, much less of it need be used than of the Bordeaux mixture. It is also uniformly alkaline, and there can be therefore no copper sulphate present to injure the foliage.

When sprayed on the trees, the thin layer of the solution is readily changed by the atmosphere, as in the case of Bordeaux mixture, into the insoluble film of copper compound that has the specific power to kill fungi. This film, owing to its thinness, has the advantage of interfering all the less with the important functions of the foliage, and also of sticking very close—a property which was found in one case to last for three months, after one spraying. Cucasa consists of molecular proportions of copper sulphate, slaked lime and cane sugar, thus being distinguished from other copper and sugar solutions by the proportions in which the constituents are present in order to produce a clear, alkaline, fungicidal solution. Its inventor is Dr. C. Rumm, of Stuttgart, Germany.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

The editorial deals with the subject of the relation between the practical agriculturist and those whose duty it is to advise him. It is intended to point out how co-operation between the planter and the agricultural department can add materially to the efficiency of the work of the latter.

Under the heading Sugar Industry, on page 51, a description is given of the way in which sugar cultivation is carried on in Peru.

The article on pages 52 and 53, which deals with the position of vanilla in the principal markets for that product, shows that this plant, generally speaking, is quite unsuited to be a main crop.

A suggestive article on the uses of cotton seed oil, especially of the refined product, is extracted on page 54.

The Insect Notes in this issue (page 58) deal with the root borer of the sugar-cane, and with two other pests that are somewhat similar in a few respects. Special attention is drawn to the remedial measures for the root borer.

The Fungus Notes, on page 59, have for their subject the more important 'smut' fungi in the West Indies.

A general account of the Conference on Agricultural Matters that was recently held in Antigua, appears on page 62.

Orange Oils in Jamaica.

A recent report by Messrs. Schimmel & Co., on orange oils from Jamaica that have been examined by that firm, states that all the samples had a good odour, and that those which were pressed from sweet fruit also agreed in their contents (apart from a slightly smaller residue of evaporation) with Italian oils. On the other hand, the two samples of bitter oil were somewhat lighter, and showed a higher optical rotation than is usually the case. It is suggested that the cause of this lies in their source of production, but that it is not unlikely that insufficient care has been taken in selecting fruit for pressing, for the variations referred to may be obtained by the addition of sweet to bitter oil.

Trade Within the Empire.

The forty-sixth statistical abstract for the British colonies, possessions and protectorates, issued by the Board of Trade, contains interesting figures, which indicate the extent of the development of those parts of the British Empire during the last fifteen years. They show unmistakably the great and increasing importance of the colonial market. During the time under review, the total value of the trade in this has more than doubled, having risen from £346,000,000 to £696,000,000 The United Kingdom's share of this total is still greater than that of all foreign countries combined, but the trade of the colonies with those countries is increasing much more rapidly than that with the United Kingdom. This is shown by the fact that, while since 1904 colonial trade with the Mother Country has increased by £138,390,000, that with foreign countries has risen by £154,172,000.

In regard to area and population, the latest returns show that the former, exclusive of the area of the United Kingdom, is 11,211,000 square miles, with a population of 343,748,000 in 1901. In 1891 the population of the Empire was, similarly, 307,483,000—an increase of over 36,000,000 in ten years.

The Availability of Phosphates in Acid Soils.

The second Research Bulletin, issued by the University of Wisconsin Agricultural Experiment Station, contains the results of work that has been taken up in continuation of previous investigations at that station, which indicated that acid soils usually stand in requirement of phosphatic manures. The new work shows that acid soils are usually lacking in available phosphates, for a higher percentage of their total phosphoric acid is united with iron and aluminium, and a lower percentage with calcium, than is the case with soils that are not acid; though this does not mean that the latter soils may not be lacking in available phosphates from some other cause. Results have been obtained which suggest that humic phosphorus may be unavailable to plants.

Another conclusion of general interest that was obtained was that $\frac{1}{5}$-normal nitric acid is an excellent indicator of the needs of a soil in relation to phosphates; this is due to the fact that it indicates the amount of calcium phosphate in soils.

'The Guide Book to St. Vincent.'

A small guide book to St. Vincent has just been compiled by the Hon. Mrs. C. Gideon Murray, wife of his Honour the Administrator: it is sold at the price of threepence. It chiefly contains short descriptions of various interesting features of the island, together with information, in regard to the prices of hire of vehicles, and those of various articles of purchase, that should be of great use to the visitor or tourist.

Rubbers and Fibres in Fiji.

A report on agriculture in Fiji for the year 1908 has recently been received. It shows that satisfactory results have been obtained with Para rubber (*Hevea braziliensis*), Assam rubber (*Ficus elastica*), and with West African rubber (*Funtumia elastica*), but not with *Castilloa elastica*. Ceara rubber trees (*Manihot Glaziovii*) were planted, but were speedily blown down, and this variety has not been replanted. It is also stated that two specimens of two native rubber-producing trees (*Alstonia* sp.) were planted in December 1908. The chief difficulty with this plant is that, when the bark is cut in the usual manner, the latex will not flow, so that, to obtain the rubber, the leaves are broken off, and the latex which runs from the broken surfaces is allowed to collect on them. Subsequently, the partially coagulated latex from a large number of the leaves is made to adhere by working with the hands. Trials are also being made with Jequié (*Manihot dichotoma*) Maniçoba rubber and with Remanso (*Manihot piauhyensis*) Maniçoba rubber.

As regards fibres, experiments are being made with sisal hemp, bow-string hemp (*Sansevieria* sp.), Manila hemp (*Musa textilis*), and ramie (*Boehmeria nivea* and *B. nivea*, var. *tenacissima*). All these were successful, except those with the bow-string hemp, and samples of the fibres received very good reports from the Imperial Institute.

The Development of Witches' Brooms of Cacao.

An interesting article appears in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, which contains useful information on this subject. It is pointed out that the chief distinguishing character of witches' broom is what is known as hypertrophy, that is growth in directions which are not followed under conditions of normal development. This hypertrophy generally consists in the fact that the twigs in witches' brooms are generally from two to six times as thick as normal ones. Witches' brooms develop from both terminal and axillary buds of ordinary branches, from the terminal buds of suckers, from that of young stems which have not yet branched, and from buds situated on the trunks and older branches, which would normally become fruiting branches.

It is explained that the phenomenon known as 'growing through the witches' broom' is caused by a partial infection of the bud, which does not extend to its tip, so that the apex develops normally, while the 'broom' is produced below it.

The characteristics of the hardened pods which are a symptom of the presence of the disease are (1) the hard consistency of the affected area; (2) the hump which is found on young and half-grown pods; (3) the hypertrophy of the stalk; (4) the 'black spot' seen on pods that are nearly ripe.

'Star blooms', which result from the production of a great number of crowded blossoms on individual stalks, or from lateral ramification of an enlarged fruiting branch, are really fruiting branches in which are exhibited symptoms of hypertrophy, together with an abnormally strong tendency to branching.

The 'Grenada Handbook' for 1910.

A copy of the 'Grenada Handbook' for 1910 has just been received, through the Colonial Secretary of that island. In this, which is the fifteenth yearly issue, the standard of usefulness of the publication has been maintained. The bulk of it consists of seven parts, the contents of each of which are as follows: Part I, almanac and chronicle of events; Part II, descriptive and historical sketch of the colony; Part III, information relating to the Government, ecclesiastical lists, members of boards, etc., persons licensed to practise and follow various professions and callings; Part IV, institutions, schools, clubs and insurance companies; Part V, postal, licence and tax information; Part VI, financial matters, meteorological statistics, flora and fauna, the dependencies of the colony, sessions of the supreme and magistrates' courts, money, weights, measures, and other, tables; Part VII, general and local directory. The book is indexed, and contains an illustration of the new jetty at Carriacou as a frontispiece.

Cassava Farine for Feeding Young Calves.

L'Agriculture Pratique des Pays Chauds for November 1909, contains an article in which work is reviewed that has been lately communicated to the French National Society of Agriculture, in connexion with the feeding of young calves on food containing cassava farine in the place of potato starch. The experiments were not only made by investigators well versed in the question of cattle-feeding, but also by small holders who, for the greater part, had never attempted artificial nourishment on skimmed milk. The results were quite satisfactory, and the calves prepared for the butcher appeared to be very little different from those which were raised upon skimmed milk mixed with potato starch. As for the latter food, the economy effected, in the feeding, over that of those which had been brought up on milk alone was considerable. It reached, in fact, 45 centimes for each kilogramme (about 2*d*. per lb.) of the live weight, for animals weighing 90 kilogrammes.

Cassava farine has marked advantages over potato starch. For one thing, the latter becomes hard and lumpy on cooling; the cassava mixture, on the contrary, naturally forms a liquid and is easily incorporated with the milk, making it easier of digestion. It is possible to mix as much as 50 to 70 grammes of cassava farine with each litre of milk; that is 1 oz. to $1\frac{1}{2}$ oz. per pint.

INSECT NOTES.

THE ROOT BORER OF SUGAR-CANE.

(*Diaprepes abbreviatus.*)

Within the past three or four months, the appearance of the sugar-cane plants in certain parts of Barbados has indicated the presence of the root borer, and when these affected canes have been dug up, the root borer grubs have been found at work in the underground portions of the plants.

LIFE-HISTORY. The Rev. N. B. Watson, F.E.S., worked out the life-history of this insect and published, in the *West Indian Bulletin* (see Vol. IV, p. 37), a very interesting and instructive paper entitled 'The Root Borer of the Sugar-cane'. In this paper, which was issued early in 1903, it was stated that the length of time occupied in the life-cycle of the root borer is about 357 days, divided as follows: egg 10 days, larva 312 days, pupa 15 days, imago 20 days. During the last 20 days, the mating and egg-laying occur. It is also stated that the principal food plants of the root borer larvae are sugar-cane, sweet potato, imphee, ground nut, and Guinea corn. Root borer larvae have also been found in the main root of bread-and-cheese (*Pithecolobium Unguis-cati*) and among the roots of young palms. The plants which the root borer does not attack much, if at all, are ochro, cassava, yams, eddos, woolly pyrol, pigeon pea, bonavist, rouncival, and beans generally.

Since the publication of this paper, cotton has come to be the most important of all the minor crops on many estates, some of which are in the districts where root borer is most abundant, and since no report has come to hand of damage to that plant by this insect, it would seem that cotton might be added to the list of plants not seriously attacked.

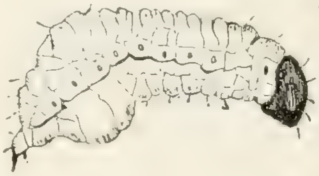

FIG. 6. WEEVIL BORER.

SIMILAR PESTS. There are three species of beetles, whose larvae are often confused, which are found in or about canes. Two of these are weevils. *Sphenophorus sericeus* (Fig. 6) is the weevil borer, which in its larval stage attacks canes above-ground and tunnels in them, always above-ground. *Diaprepes abbreviatus* (Fig. 7) is the root borer which, in the larval stage, tunnels the underground portion of the cane and eats the roots. The third of these insects is the hard-back (*Ligyrus tumulosus*, Fig. 8), which lives in the ground and nearly always feeds on dead or decaying vegetable matter. This grub has three pairs of slender legs, and is thus distinguished from both the others, which have no legs. As has been already stated, one of these always attacks the cane above ground, and the other under the ground; they may be further distinguished by the presence, in the weevil borer, of a large hump, or abdominal distention. The accompanying illustrations will make these differences clear.

FIG. 7. ROOT BORER.

NATURE OF DAMAGE. The damage to the cane by the root borer results from the destruction of a very large portion, sometimes practically all, of its underground stem system. The injury to the fibrous roots is not so complete and not seen as plainly. The effect of the demolition of this underground stem system is that the connexion between roots and leaves is cut off, and the plants die for want of water, as this cannot be transmitted to the above-ground portions of the plant, even though the roots are able to collect it. The appearance of canes dying from the attack of the root borer is very much like that of canes dying from root fungus (*Marasmius*) or from drought

HISTORY OF PRESENT ATTACK. The present attack was first noticed in Barbados during December last, in full-grown canes, then ripening. A few stools at the edges of the fields were seen to be in a dying condition, and then, as the attacked canes gradually succumbed, the number of dying stools was seen to be greatly increased; finally, at the beginning of the present month, a field of plant canes, in which the young shoots were about one foot in height, was discovered to be infested, and many of the young sprouts were dying. In the case of the young plant canes, it was found that the cuttings which had been planted, and from which the shoots were springing, were tunnelled through and through, all the stored up food for the shoots having been consumed. As many as four grubs have been found in one cane cutting.

REMEDIES. In dealing with fields of young canes badly attacked by root borer, the most profitable course will probably be to fork or plough up the canes, and destroy in this way as many of the grubs as possible. Carbon disulphide may be found useful in dealing with attacks of root borer in young canes if the attack is not very serious, and if it can be taken at its earliest appearance. Experiments are necessary in order to demonstrate the usefulness of this material, and the expense of its application in field work.

PREVENTION. The most satisfactory method of dealing with root borer will be one that includes estate practice calculated to reduce its numbers.

The full-grown canes which are at the present time being attacked are now ripening, and will be cut and milled within the next two or three months. Planters should make every effort to have all cane stumps in infested fields dug out at the earliest possible moment after the canes have been removed. If a supply of labourers is available, the stumps should be headed out and thrown into stacks, with plenty of lime. If it is not possible to have the stumps removed from the field, they should be dug up and chopped open with two or three cuts of the hoe, and left on the ground. In any event, the bottom of the holes should be forked and limed, so as to thoroughly dry out any grubs or pupae that may be left behind when the stumps are dug out. The breaking up of the stumps will expose the grubs to drying and to the attacks of ants, birds, lizards and toads; it seems likely that very few of the borers in the cane stumps dug out in this way, and in the holes forked and limed as has been recommended, will ever arrive at maturity. It will be found that attacked canes are very easy to dig, in comparison with healthy ones. This is not an expensive practice, and ought to become a part of the routine work on every estate.

FIG. 8. GRUB OF THE HARD-BACK.

On estates where ratooning is practised, the stumps should be dug as soon as the ratoon crop has been taken off. If fields which were intended for ratooning are badly attacked, it will probably be found most profitable to dig the stumps, as suggested above, and to omit ratooning

for a season. However, it is for the owner or attorney to decide whether the profit from one crop of ratoons shall be lost, or whether the root borer shall be allowed to live out its life-cycle and emerge in such numbers as to infest the entire estate, and possibly cause the loss of the entire crop.

It has already been stated that the stumps should be dug out immediately after the canes are cut, and this point should be repeatedly emphasized, as it is of the utmost importance.

It might be laid down as a rule that all the cane stumps on infested estates, and in infested districts, should be dug out before the first of July in each year. If this were done, the attacks of root borer and root fungus would be greatly reduced.

To guard further against attacks of root borer, a rotation of crops should be established, so that sugar-cane, sweet potatos, imphee, Guinea corn and ground nuts should never follow each other immediately, on the same ground, or any of them be planted *two seasons successively* in the same fields. The rotation should provide that canes or potatos should be followed by a crop, such as cotton, cassava, woolly pyrol and yams, which is not seriously attacked by root borer.

SUMMARY. The root borer is a serious pest, but it can be controlled by estate practice, which includes, firstly, the digging of the stumps, forking and liming the holes from which they have been dug, *immediately after* the canes have been cut; and secondly, a rotation of crops which provides that the favourite food plants of the root borer, such as cane and sweet potato, do not follow each other on the same land.

Root fungus (*Marasmius*), which is very abundant in the West Indies at the present time, and which is always associated with root borer, would be very effectually checked by the treatment suggested for the root borer.

The careful carrying out of these recommendations must result in reducing the numbers of the root borer to such an extent that its presence in cultivated fields will not be noticed, and the damage done by root fungus will be greatly reduced at the same time.

The Importance of Seed Improvement.

The report of the American Breeders' Association for 1908 has recently appeared. Among its contents is an article by the Chairman of the Committee on Pure Bred Seed and Plant Business of that Association, in which some interesting points appear. It has been found that, in connexion with work of promoting grain and vegetable contests, practically the entire benefit comes, firstly, from the improvement which results from commencing with better seed, and from the very careful selection of seed grown on the home farm; secondly, from the education which the grower receives through being brought into contact with progressive farmers and breeders, and seeing what has been accomplished already. A practically perfect sample of corn, for instance, exhibited at a show or fair, in competition, shows those who are interested that improvement is possible. The stock-feeder, too, who goes to a show and sees a useful, meaty animal that is quite different from the type with which he has always been familiar, has received an illustration of what can be done by following the principles of selection, in breeding.

The article is concluded by a contribution from another member of the committee, which states: 'I am satisfied that every farmer could improve his grain at least twenty-five per cent. by hand-picking enough grains for a single acre and growing his own seed, and the lesson he will have will be of great benefit to him in general farming.'

FUNGUS NOTES.

THE 'SMUT' FUNGI.

These fungi belong to the group Ustilagineae, and cause well-known diseases of various species of the grass family (Gramineae), more especially of the different cereal crops. The mycelium grows through the tissues of the host plant, between the cells, and gives rise to small outgrowths known as haustoria, which penetrate the cells and obtain food from them for the fungus. In this condition, the fungus affords no outward manifestation of its presence in the host plant. When about to produce spores, however, masses of mycelium are formed in the young parts of the host, very frequently in the ovary, and large abnormal swellings are produced in the portions so affected. These swellings are first of a whitish colour but, after a time, they become dark-greenish, or brownish-black. This is due to the formation of numerous spherical dark-brown or black spores under the outer tissues of the host plant and within the hyphae of the fungus. When these spores are ripe, the tissues of the host are usually burst, and the spores escape as a black dust. When one of these spores germinates it may either form a mycelial tube directly, or it may give rise to a four-celled tube known as a promycelium, from each cell of which conidia may arise. The formation of conidia may continue for some time, and further, each conidium, if it falls on some source of food-supply such as portions of manure or decaying pieces of the original host plant, may in many cases bud off further spores, in the manner of yeast. The first-formed dark spores do not usually germinate at once, but remain in the soil from the autumn in which they are formed until the following spring, and then germinate, thus infecting the suceeding crops.

In the West Indies, Indian corn or Maize (*Zea Mais*) is occasionally attacked by one of these fungi (*Ustilago Maydis*). The disease has never been of any serious importance, though occasional instances of it are fairly common. In the United States, very considerable losses are sometimes caused by it. The disease appears as whitish swollen galls on all parts of the plant, especially on the cobs. These galls may attain the size of a man's fist. Eventually, they turn greenish-black, and burst, setting free a mass of dark-brown spores. The spores are spherical, and covered with delicate spines.

Grain from cobs infected in this way should not be fed to animals for two reasons. In the first place it is very injurious when given in any considerable quantity; in the second, spores which have passed through an animal and are returned to the land infect fresh plants more easily than those which have merely been lying on the ground. Fresh pen manure encourages the spread of the disease even when uninfected.

The best remedy is to burn or bury infected plants before the galls burst. Seed from near infected plants should never be sown.

Sugar-cane is occasionally attacked by one of these fungi (*Ustilago sacchari*); the disease is fortunately rare in the West Indies. The plants are usually affected at the growing apex of the stem, and exhibit a long whip-like process, often several feet in length and much curved on itself. This process is at first covered by a silvery white sheath, but it eventually turns black, owing to the formation of numerous brown, smooth-walled spores, which are liberated by the bursting of the sheath. Diseased canes give rise to fairly numerous secondary shoots from their lower portions, which become affected, and the whole stool is rendered useless.

GLEANINGS.

In the St. Lucia *Gazette* for the 22nd ultimo, there is published a list of plants, with prices, that will be on sale at the Botanic Station during the present year. For exported plants, the sale prices will be 50 per cent. higher than those given in the list.

Notification has been made that the next International Rubber and Allied Trade Exhibition will be held at Olympia, in May or June 1911. For further particulars, application should be made to the organizing manager, Mr. Staines Manders, 75, Chancery Lane, London, W.C.

In the *Agricultural News*, Vol. VIII, p. 300, attention was drawn to the fact that plans were being made for the establishment of an English scheme for producing beet sugar in Lincolnshire. It is now stated that these have failed, but there are hopes of a revival of them in the near future.

The Colonial Report for Jamaica, 1908-9 (No. 626) contains the following statement: The standard of teaching in the primary schools appears to be gradually improving, and much greater attention is being given to elementary science, agricultural teaching, and manual training, than formerly.

An official announcement has recently been made that an exhibition to be known as the Grand Exhibition of Japan will be held in Tokio from April 1 to October 31, 1912. The exhibition will cover an area of about 292 acres, and all foreign Governments and peoples are invited to take part in it.

The following points of a good sample of broom corn are given in the *Rhodesian Agricultural Journal* for December, 1909: length of fibre not less than 14 inches; length of butt, not more than 4 inches. The fibre should not be coarse or stiff; it should be tough and flexible, not brittle; the colour should be pale with a green tint throughout.

The report of the Curator of the Botanic Station, Montserrat, for December 1909, shows that the following was the distribution from that station for the month. Plants: limes 1,000, papaw 1,000, cacao 175, ornamental 40; cuttings: sweet potatos 4,300, sugar-cane 2,485, *Gliricidia maculata* 300, cassava 100, ornamental 450.

The largest spinning mill of the Chemnitz district is exhibiting fabrics made from caravonica cotton and silk cotton (kapok). It was at the instigation of the manager of this mill that careful experiments in manufacturing fabrics from these two fibres were made in Germany, and the results have been more than satisfactory. The fibres seem to flourish in the German African colonies, and production on a large scale is being attempted.

An interesting article on hurricanes and hurricane relief, by his Honour F. H. Watkins, I.S.O., appears in the Colonial Office Journal for January 1910. In connexion with this, reference may be made to the editorial in Vol. VIII, No. 188, of the *Agricultural News*, as well as to the footnote on page 230 of the succeeding number.

Estimates by the District Officers give the area under cotton in the Province of Eastern Bengal and Assam, for 1909-10 as 97,700 acres against 97,200 acres for the previous year. Owing to unfavourable weather conditions, it is expected that the outturn will not exceed two-thirds of last year's crop; and accordingly, it is estimated at 14,600 bales of clean cotton.

On the 22nd ultimo, premiums amounting to £25, which were granted by the St. Lucia Agricultural Society, were distributed to 19 petty proprietors and peasants, for cotton growing. In the unavoidable absence of the Hon. E. J. Cameron, C.M.G., Administrator, the presentations were made by the Acting Administrator, the Hon. A. De Freitas.

According to the *Diplomatic and Consular Reports*, No. 4386, Annual Series, the export of sesamum seed from China, during 1908, was 2,133,851 cwt., as compared with 874,657 cwt. in 1907, and the production for 1909 will probably exceed that of 1908. Large quantities of the seed are exported direct to Europe, where it is said to be used for making the finest lucca oil.

Bulletin No. 138 of the University of Illinois Agricultural Experiment Station, entitled *Pasteurization as a Factor in Making Butter from Cream Skimmed on the Farm*, has just been issued. As a summary of several interesting conclusions, it is stated that pasteurization does not improve the quality of butter made from sour cream obtained on the farm.

The *Bulletin of Agricultural Information*, Trinidad, No. 61, New Series, gives a recipe for an emulsion to be used for plant diseases, which is due to Professor Carmody. It is called kerosene-lysol emulsion, and consists of: kerosene 6 volumes, lysol 2 volumes, water 100 volumes. It is stated that this solution, on account of the germicidal properties of the lysol, is fully equal to a 10-per cent. kerosene emulsion, and that in some cases it would have to be further diluted before use.

In order to encourage the exportation of fruit from Brazil to Europe, the Government of that Republic has decided to insist that ships with 'packet priveleges' must be supplied with cold storage room for fruits and other perishable agricultural products. For the same purpose, prizes have been instituted by the Government which will be awarded to any one who can prove to the Minister of Agriculture that he has exported the largest quantity of fruit, in good condition, within a period of eight months from the date of the issue of the decree, provided that the quantity exported is not less than 50 tons.

STUDENTS' CORNER.

FEBRUARY.

First Period.

Seasonal Notes.

On cacao estates, the produce of the early pickings will have completed the process of curing. Samples of cacao should be taken at different stages of this, with the view of observing, as far as possible, the changes which it undergoes successively. As the result of many investigations, it is generally agreed that the quality of the product is more dependent upon that of the beans employed than on any circumstance of the curing. In any case, cacao is improved by fermentation, and this is generally practised, comparatively little cacao that has been merely dried being in demand. Note that the chief objects of the curing are to cause changes in the pulp which will enable the cacao to be kept without deterioration; to cause it to acquire a flavour; and to give the beans a good 'break'. What is the use of the last-named quality? Two explanations are sometimes given as to what really takes place, that is of importance, when cacao is fermented. In one, this is held to be the termination of the life of the bean; in the other, it is said to be 'malting', that is the partial germination of the seed, which is subsequently stopped by the rise of temperature. Neither of these seems to be correct, for the first may be effected by mere drying, when the characteristic properties consequent on fermentation are never obtained; while, in the case of the latter, a good product may be procured in the absence of any germination whatever. In fermentation, as a matter of fact, the most important circumstance seems to be that absorption takes place through the testa, while the latter remains intact; any rupture of the testa is likely to result in the admission of fungi, with a consequent deterioration in the value of the product. What methods are in vogue for drying cacao? Describe any form of apparatus, that you may know of, which is used for effecting this. What is meant by 'claying' cacao? Are there any advantages that are possessed by clayed cacao which are not found in the case of cacao that has not been so treated? In both fermentation and drying, extreme cleanliness should be observed. What is the chief reason for this? In the preparation of cacao, what is the purpose of trampling? Take note of the way in which the product is packed for shipment.

In the case of lime trees, discuss the advisability of pruning. All dead wood that has been removed should be burnt. Why is this? What tissues are most active in healing wounds in the stems of trees? Particular care should be exercised in order to make sure that all cut surfaces have been tarred, or covered with some similar antiseptic substance. Resin oil has been suggested for the purpose: where this is used, it should be mixed with an amount of tar or lamp-black sufficient to make it show a distinct dark colour when spread over a surface; otherwise, it will be difficult to distinguish between the treated and the untreated wounds, and some may be neglected as a result. What is the object of the application of such substances to cut surfaces?

For what purposes may pruning be employed? Describe carefully how a large branch should be removed from a tree. Why should care be taken to avoid any tearing of the bark? Where, in relation to the main stem, should the cut be made, and why? What are the advantages of making it straight across the branch, instead of in an oblique direction? Carefully ascertain what are the effects of pruning upon the part of the plant which remains. (See Pamphlet No. 52 of the Department Series.)

At present, the root borer of the sugar-cane is attracting a certain amount of special attention. Study the life-history of this pest, and ascertain exactly in what way it does injury. What other plants is it known to attack, and what importance has this consideration in the matter of the rotation of crops? Distinguish between this pest and the weevil borer, and consider the life-history of the latter in a similar way to that given above for the root borer. Remember, however, that in doing all this, where the insects exist, careful observations in the field are necessary, and may result in the discovery of useful and important facts.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) By what agencies, natural aud artificial, is the nitrogen of the air made available for plants as food?

(2) What advantages and disadvantages are likely to result from allowing lime trees to become covered with the Bengal bean?

(3) How is lime applied to the soil? What are the usual circumstances and uses of such application?

INTERMEDIATE QUESTIONS.

(1) Give a method of eradicating a dangerous weed, such as 'Devil's grass', from cotton fields.

(2) Mention, broadly, the composition of the juice of the ripe sugar-cane. How does that from the unripe cane chiefly differ from this?

(3) How is the nitrogen in sulphate of ammonia converted into nitrate nitrogen, in the soil?

THE PASSAGE OF HEAT THROUGH SOILS.

The following are some of the conclusions reached in regard to this subject, in Bulletin No. 59 of the Bureau of soils, United States Department of Agriculture:—

The transfer of heat from one soil particle to another is influenced by the fluid filling the space between them, and of course, this transfer is more easily effected when the fluid is a good conductor of heat. In addition to the heat conductivity of the fluid, another factor has to be considered, that is the resistance to the heat transfer which is found at the boundary between the substances in contact. This 'transfer resistance', or its reciprocal, 'transfer conductivity', is of sufficient magnitude to enter into thermal calculations. If the fluid be in motion, there will be developed a resistance to the transfer of heat, which has been shown to vary approximately with the square root of the velocity of the fluid.

Heat will pass from a grain of soil to soil water one hundred and fifty times more easily than from a grain of soil to soil atmosphere. This comparison seems to point out one reason why an air-dry soil shows such a low heat conductivity. The rapid circulation of the soil atmosphere as eddy currents within the minute spaces between the soil grain would, however, decrease the transfer resistance very greatly. Such eddy currents are inevitably set up, as the hot soil atmosphere on one side of a soil cavity expands and moves up, and is replaced by the colder gases.

The increase in heat conductivity of a soil produced by wetting it is thus entirely due to the better contact between the soil grains thus produced, since the soil material has, in continuous massive condition, a much higher heat conductivity than water.

A soil conducts heat best and most quickly with a moisture content near that recognized as the optimum.

THE RECENT CONFERENCE IN ANTIGUA CONCERNING AGRICULTURAL MATTERS.

A report has just been issued by those who recently went from Barbados to Antigua, in order to enquire into the working of central sugar factories and the system of implemental tillage that is in vogue there, as well as to confer on other agricultural matters. (See *Agricultural News*, Vol. IX, p. 7.) This report has been employed in compiling the following information.

The members of the expedition were:—the Hon. Francis Watts, C.M.G., D.Sc., the Imperial Commissioner of Agriculture for the West Indies: the Hon. F. J. Clarke, C.M.G., M.A., M.C.P., President of the Agricultural Society and Speaker of the House of Assembly; Messrs. J. R. Bovell, I.S.O., F.L.S., F.C.S., Superintendent of Agriculture; S. S. Robinson, M.C.P.; F. W. Greaves, J.P.; E. L. Skeete, B.A.; Jos. Connell; D. G. Simpson and Dr. E. G. Pilgrim.

On Wednesday, January 5, the members of the expedition embarked on board the SS. 'Dahome' *en route* for Antigua, via St. Lucia and Dominica. St. Lucia was reached at 7 a.m., on the morning of the 6th. On their arrival, the members were met by Mr. J. C. Moore, the Agricultural Superintendent. Directly afterwards, the Hon E. J. Cameron, C.M.G., the Administrator of St. Lucia, very kindly came on board to confer with the Commissioner of Agriculture as to the plans for the day, so as to facilitate as far as possible the arrangements for this. The members visited the Botanic Station, and then were taken by means of the Government launch, placed at their disposal by the Hon. E. J. Cameron, to the Cul-de-Sac sugar factory, to which they were accompanied by Messrs. G. Graf and J. Devoeux, Directors, being subsequently met by the Hon. E. G. Bennett, K.C., Managing Director, and Mr. L. Springer, manager of the estate. After inspecting the factory and cultivation, they embarked on the SS. 'Dahome', which, through the courtesy of Captain Gorst, had come to meet them.

Dominica was reached at daylight on Friday, January 7. Here they were met by Mr. Joseph Jones, the Curator of the Botanic Station, and Mr. Lambert Bell. The members visited the Botanic Garden, Experiment Station and Agricultural School; the Bath lime estate, through the courtesy of Mr. H. A. Frampton; and lime and cacao cultivations in the Roseau Valley. On their arrival at Antigua, the members of the party were met by the Reception Committee that had been appointed by the Agricultural and Commercial Society to receive them. That afternoon, the members of the expedition were received by his Excellency the Governor and Lady Sweet-Escott, and afetrwards they visited the Botanic Garden, and the sugar-cane, cotton, and other plots at the Experiment Station at Skerretts. On this day, Messrs. F. R. Shepherd, A. D. C. Adamson, and A. Davis, who had been appointed by the Agricultural Society of St. Kitts to visit Antigua, arrived by the R.M.S. 'Esk' from that island.

After breakfast on Monday, January 10, the members were taken by rail to Gunthorpes Central Factory where they were met by Mr. and Mrs. E. Moody Stuart, a number of the local planters, and others. After inspecting the factory, the members of the expedition were entertained at luncheon by Mr. Moody Stuart, assisted by the staff. After luncheon, they visited the reservoir that had recently been made for storing water for the use of the factory, and from there they went to Fitches Creek, an estate on which implemental cultivation based on the Louisiana system is carried out. From Fitches Creek they proceeded to Millars estate, the property of the Hon. J. J. Camacho, where they were kindly and hospitably entertained by Mrs. Camacho.

On the morning of Tuesday, January 11, the members of the expedition first visited Belmont estate, where they were shown over the buildings by Messrs. E. and J. Dew, one of whom is the manager and the other the engineer. At this estate, there is installed what is known as the Santa Cruz system of sugar manufacture, owing to its having been first adopted in that island. From Belmont, the party proceeded, at the invitation of Mr. A. St. G. Spooner, to Bendals to inspect the factory and cultivation on that estate. After going over the factory and the stock-pens, where fine imported donkeys, a jack and a jenny, and native-bred mules were seen, the members were kindly entertained at luncheon by Mrs. Spooner. After luncheon, the party was taken to inspect the cultivation on the estate. From Bendals, the members went to the Blubber Valley estate where they were met by Mr. T. E. Peters, the proprietor, and Mr. S. B. Smith, the manager. On this estate, the Santa Cruz system of sugar manufacture has also been installed. After inspecting the factory, the members were taken up the Christian Valley to view the scenery. On their return, they were hospitably entertained by Mr. Peters, at Jolly Hill.

On Wednesday, January 12, the members of the expedition from Barbados and St. Kitts-Nevis, met in conference in the Council Chamber at the Court House, a number of the members of the Agricultural and Commercial Society of Antigua. The members present at the Conference, in addition to those from Barbados, mentioned above, were: from St. Kitts, Messrs. F. R. Shepherd, A. D. C. Adamson and A. Davis; from Antigua, Hon. J. J. Camacho, Hon. R. L. Warneford, Messrs. A. St. George Spooner, H. A. Tempany, T. E. Peters, R. Bryson, N. Scott Johnson, R. S. D. Goodwin, Joseph T. Dew, Ernest Dew, J. C. Walrond, L. S. Cranstoun, J. D. Harper, Major W. H. Ledeatt, Messrs. I. E. Dyett, J. J. Roden, H. J. Hall, A. H. Stamers, Robert Goodwin, C. Griffin, J. B. Smith, Stephen R. Mendes, Robert W. Dobson, L. I. Henzell, W. G. Richardson, G. A. Macandrew, D. N. Rannie and E. Moody Stuart, with Messrs. J. D. Wall and R. H. Malone as Honorary Secretaries.

The Conference was opened by his Excellency the Governor, Sir E. Bickham Sweet-Escott, K.C.M.G., who extended a hearty welcome to the visitors from Barbados on behalf of the several Presidencies of the colony. He would, however, before they proceed to business, like, he said, to emphasize the distinctly unofficial character of the gathering, and he was sure his friends from Barbados would be at one with him in the view that they had no authority from the Barbados Government to discuss matters of common interest, and although he, as Governor, was very glad to be present and welcome them, it did not imply any official character in the proceedings of the Conference itself. After mentioning the subjects of central factories, trade reciprocity with Canada, and the work of the Royal Commission at present holding sessions in connexion with the latter, his Excellency once more extended, on behalf of the Presidencies of Antigua and St. Kitts-Nevis, a most hearty welcome to their friends from Barbados, and expressed the hope that the result of their visit to the island would be the establishment of closer relations of all kinds between the two ancient possessions of the Crown.

Dr. Watts replied, thanking his Excellency, on behalf of those who had accompanied him from Barbados, and of those who had joined him in Antigua, for the welcome extended to them, and emphasizing the unofficial nature of the meeting. He also thanked the Antigua Reception Committee, in the same way, as well as the planters who had enabled the visitors to view the work, etc., on their estates,

and concluded with a short résumé of the objects of the expedition.

The Hon. F. J. Clarke, on behalf of the visitors, especially of his friends from Barbados, thanked his Excellency and the people of Antigua for their cordial welcome, and the great kindness and hospitality that had been shown them.

The Governor then left the meeting, and the chair was taken by Dr. Watts. Mr. F. R. Shepherd and Mr. H. A. Tempany read memoranda in connexion with the subject under discussion, which had been drawn up by the Agricultural Societies of St. Kitts and Antigua respectively. Mr. Bovell explained the position in Barbados, and, finally, certain resolutions were passed unanimously by the conference. For these, see *Agricultural News*, Vol. IX, p. 29.

After the resolutions had been passed, the visitors were entertained at a luncheon by the Antigua members of the Conference, at which the Governor presided. In the afternoon they were taken to Friar's Hill, the property of the Hon. J. J. Camacho, to see the Santa Cruz system of sugar manufacture that is installed there, and to view the surrounding country. While at Friar's Hill, the visitors were hospitably entertained by Mr. Harper, the manager of the estate.

On Thursday morning, January 13, the members were taken by rail to North Sound estate, where they saw in operation the various ploughs, cultivators, etc., that are used in what is known as the Louisiana system of cultivation.

On leaving North Sound, the party was taken to Montpelier estate, where it was met by Mr. A. St. G. Spooner. At this estate, the Santa Cruz system was in full working, crushing and evaporating the juice from the remains of canes from which cuttings had been taken for replanting the estate. From Montpelier the party proceeded to Parham New Work whence, after inspecting the sugar factory which is also based on the Santa Cruz system, they went to Parham Hill, the residence of the Hon. J. F. Foote, at which they were kindly entertained by Mrs. Foote. In the evening, the members of the expedition were entertained at dinner by his Excellency the Governor and Lady Sweet-Escott.

On Friday, January 14, at 10 o'clock, the visitors from Barbados and St. Kitts-Nevis met in conference the representatives of the Antigua Agricultural and Commercial Society, when the following papers were read and discussed: (1) 'Five years working of the Antigua Sugar Factory', by Mr. L. I. Henzell. (2) 'Muscovado Sugar Making by Steam Boiling', by Mr. A. St. G. Spooner. (3) 'Implemental Cultivation', by Messrs. E. Moody Stuart and I. E. Dyett. (4) 'Systems of Agricultural Education', by Dr. F. Watts. (5) The Introduction of Insectivorous Birds', by Mr. G. Moody Stuart'.

The papers read will be published in the *West Indian Bulletin*.

In the afternoon, a general meeting of the Agricultural and Commercial Society was held in the Council Chamber, under the presidency of his Excellency the Governor, when the subject of the root disease of the sugar-cane was discussed.

The members of the expedition were to have left Antigua by the Pickford & Black SS. 'Sobo', on Saturday, January 15; but owing to the non-arrival of that vessel until Monday, the 17th, they were unable to embark for their return journey to Barbados until the afternoon of that day.

In conclusion, the members of the expedition place on record their appreciation of the great kindness and courtesy extended to them by the Agricultural and Commercial Society and the people of Antigua, as well as by those in St. Lucia and Dominica who were good enough to receive them and make their visit to those islands interesting and enjoyable.

RICE-GROWING IN THE UNITED STATES.

The following information is obtained from an article in the *Rice Belt Journal*, in which is summarized the information given in the final report of the Bureau of Statistics of the United States Department of Agriculture, issued on December 20, 1909:—

In area, Louisiana leads with 375,000 acres; Texas follows with 291,000 and Arkansas comes next with 28,000; South Carolina has 18,000 acres, Georgia 4,200, Florida and Mississippi 1,000 each, and North Carolina 425 acres. In this connexion it is worthy of note that the greatest increase next year will be along the Mississippi river and in Arkansas, where considerable development is taking place. The greatest increase will be in eastern Louisiana, and there are prospects of considerable increase in the State of Mississippi, while Arkansas may safely be expected, according to the well-informed, to double its present acreage. There will be an increase in St. Landry parish, Louisiana, but in the parishes of Acadia, Calcasieu and Vermilion, a material decrease is certain, although 10,000 acres of new land will be put in by the United Irrigation and Rice Milling Company, which is extending its canals. The total acreage of rice in the United States is placed at 720,000—a reduction of 11,000 from the preliminary estimate, and an increase over that of last year of 65,000.

In yield per acre, Arkansas leads with an average of 40 bushels; Alabama follows with 35, and Texas comes next with 34; Louisiana is two-tenths of a bushel behind Texas, its production being 33·8 bushels per acre; North Carolina averages 30·2 and Mississippi 30 bushels, while South Carolina produces only 25·6 bushels to the acre, on an average, and Florida follows with still lower average.

The average price per bushel of rough rice on December 1 was 79·4c. The price of South Carolina rice led at 91c. Arkansas rice followed at 90c. and Georgia and North Carolina rice came next at 87 and 85c., respectively. Florida, Alabama and Mississippi rice brought 80c. and the two great rice-producing states of Louisiana and Texas followed in the order named; Louisiana rice brought 79, and Texas rice, 78. The total farm value of the rice crop of 1909, on December 1, 1909, is placed at $19,341,000.

The Department's figures as to acreage and production in Louisiana and Texas are largely based on reports received from the farmers, mills and warehouses, and are generally accepted as being reliable. Figures on other points are doubtless correct, although the quoted prices for rice may be a trifle higher than those actually paid.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated February 4, 1910, gives information as follows:—

The weather during the fortnight has continued wet, and as a consequence, milling has been very much interrupted.

Prices have remained firm, and with light deliveries to town, we expect price to advance.

Shipments to the islands during the fortnight amounted to 3,784 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 16*s.* 9*d.* to 17*s.* 9*d.* per bag of 180 lb. gross.
15*s.* 9*d.* to 16*s.* 9*d.* „ „ „ 164 lb. „

MARKET REPORTS.

London,—The West India Committee Circular, February 1, 1910; Messrs. E. A. de Pass & Co., January 7, 1910.

Arrowroot—No quotations.
Balata—Sheet, 2/6½; block, 2/1½ per lb.
Bees-wax—No quotations.
Cacao—Trinidad, 52/6 to 62/- per cwt.; Grenada, 48/- to 53/- per cwt.; Jamaica, 47/- to 52/-.
Coffee—Jamaica, 38/- to 120/-.
Copra—West Indian, £26 to £26 10*s.* per ton.
Cotton—Fully Fine, 17¾*d.*; Floridas, no quotations; St. Croix West Indian, no quotation.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 45/- to 49/- per cwt.; low middling to middling, 50/- to 54/-; good bright to fine, 55/- to 65/-.
Honey—No quotations.
Isinglass—No quotations
Lime Juice—Raw, 10*d.* to 1/-; concentrated, £18 to £18 10*s.*; Otto of limes, 6/-.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—Steady.
Pimento—Common, 2¼*d.*; fair, 2 5/16*d.*; good, 2⅜*d.* per lb.
Rubber—Para, fine hard, 7/10, fine soft, 7/7; fine Peru, 7/9 per lb.
Rum—Jamaica, 2/7 to 5/-.
Sugar—Crystals, 16/- to 18/3; Muscovado, 13/3 to 15/-; Syrup, 13/9 to 14/9; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., January 21, 1910.

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11c. to 11⅜c.; Trinidad, 11⅜c. to 11⅞c.; Jamaica, 9¾c. to 10½c. per lb.
Cocoa-nuts—Jamaica, select, $26·00 to $27·00; culls, $17·00 to $18·00; Trinidad, select, $25·00 to $26·00; culls, $15·00 to $16·00 per M.
Coffee—Jamaica, ordinary, 8¾c. to 9c.; good ordinary, 9¼c. to 9½c.; and washed, up to 11½c. per lb.
Ginger—9½c. to 11½c. per lb.
Goat Skins—Jamaica, 64c.; Barbados, 55c. to 57½c.; St. Thomas, St. Croix, St Kitts, 51c. to 53c. per lb.; Antigua, 55c. to 57½c., dry flint.
Grape Fruit—$1·50 to $2·50 per box.
Limes—$4·00 to $4·50 per barrel.
Mace—34c. to 37c. per lb.
Nutmegs—110's, 10c. per lb.
Oranges—Jamaica, $1·25 to $1·50 per box.
Pimento—4⅜c. per lb.
Sugar—Centrifugals, 96°, 4·08c. per lb.; Muscovados, 89°, 3·58c.; Molasses, 89°, 3·33c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., February 5, 1910.

Cacao—Venezuelan, $12·50 per fanega; Trinidad, $11·50 to $12·00.
Cocoa-nut Oil—$1·00 per Imperial gallon, cask included.
Coffee—Venezuelan, 10¾c. per lb.
Copra—$4·50 per 100 lb.
Dhal—$4·20 to $4·30 per 2-bushel bag.
Onions—$3·50 to $3·75 per 100 lb.
Peas, Split—$7·00 to $7·25 per bag.
Potatos—English, $1·30 to $1·60 per 100 lb.
Rice—Yellow, $5·00 to $5·10; White, $5·00 to $5·10 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., February 14, 1910; Messrs. T. S. Garraway & Co., February 14, 1910.

Arrowroot—St. Vincent, $3·60 to $3·75 per 100 lb.
Cacao—$10·00 to $10·50 per 100 lb.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb., scarce.
Hay—$1·20 per 100 lb., dull.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—Bunched, $4·50 per 100 lb.
Peas, Split—$6·25 to $6·50 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
Potatos—Nova Scotia, $1·75 to $2·00 per 160 lb.
Rice—Ballam, $4·20 to $4·60 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, December 24, 1909; Messrs. Sandbach, Parker & Co., February 4, 1910.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·25 to $8·50 per 200 lb.	$8·50 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
Cacao—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
Cassava—	$1·08	No quotation
Cassava Starch—	$6·00 to $6·50 per barrel of 196 lb. Sales—scarce	No quotation
Cocoa-nuts—	$12 to $16 per M.	$16 per M., peeled and selected
Coffee—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	13½c. to 13¾c. per lb.	14c. to 14½c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	$4·05 to $4·10 per bag of 168 lb.	$4·00 to $4·75 per bag of 168 lb.
Green Dhal	$5·50 to $5·75	——
Eddos—	$1·68 per barrel	— —
Molasses—Yellow	22c. to 25c.	——
Onions—Teneriffe	-	No quotation
Madeira	4c. to 4¾c. per lb.	No quotation
Peas—Split	$6·50 to $6·60 per bag (210 lb.)	$6·50 per bag (210 lb.)
Marseilles	$4·00 to $4·25	$4·50
Plantains—	20c. to 48c. per bunch	— —
Potatos—Nova Scotia	$2·50	$3·50
Lisbon	No quotation	No quotation
Potatos—Sweet, Barbados	$1·44 per bag	——
Rice—Ballam	No quotation	$4·75
Creole	$4·00 to $4·10	$3·60 to $3 80
Tannias—	$2·40 per bag	——
Yams—White	$2·40	——
Buck	$2·88 per bag	——
Sugar—Dark crystals	$2·55 to $2·75	$2·60
Yellow	$2·90 to $3·00	$2·80 to $3·00
White	$3·70 to $3·80	$3·60 to $3·80
Molasses	$2·00	$2·00 to $2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Problem of Agricultural Education.

I. The Essentials of Education.

ONE of the greatest advances in educational matters was made when it was realized that the conditions of life had so changed, and the work that had to be done every day for the people of a country had become so specialized, that it was no longer feasible to educate its inhabitants according to one broad plan, the methods of which should be generally applicable to all of them. The increase of population, for one matter, had made it necessary that the things required for the daily life should be produced on a large scale, by the aid of machinery, rather than by individual craftsmen, and the cheapening of the products of the new mode of manufacture, together with the improved conditions of living, had again reacted by bringing about a state of affairs that further favoured the tendency for the population of a country to increase at a greater rate than that which had ever obtained before. Competition became keen, and it was seen that education must no longer be simply a matter of general preparation for living as an adult, and of the provision of means for inculcating the principles of discipline, but that it must be conducted, for each individual, in a manner which had definite relation to that part of the world's work to which his energies would be devoted ultimately.

The first effect of the realization of this fact has been to cause much stress to be laid on that side of education which has for its object the production of technical efficiency. There has been, in fact, too great a tendency to give instruction, and to leave out most of that which includes the essentials of true education. The result has been the production of schemes which went little further than to devise means for imparting knowledge, so that, in relation to all that is meant by education, no real advance was made on the old system. Under the former conditions, the individual attained to a wider experience, and little interference was made with the chances for his later specialization, while the new method limited him from the first, and did less to provide him with the means of liberally enjoying his leisure. Another result has been that whatever has had relation to the more mechanical arts and crafts has been fostered, to the comparative neglect, until

recent years, of the claim of the agriculturist to be fitted in the best possible way for the work which is to be his through life. Perhaps this late recognition of such a claim is not without its advantages, for it has come at a time when it is continually realized to a greater degree that mere instruction is not education, and that the aim of those who have the framing of schemes for education in their hands should not be the training of individuals to be merely capable of doing a certain thing in a certain way. Such schemes should, on the contrary, bring out the mental energies of those individuals, so that they may be able to appreciate the true inward meaning of what they are taught, and to attain that mental independence which will lead to critical consideration of the work of others, while giving them the capacity usefully to extend the scope of their own.

The West Indies share with all other tropical countries the circumstance that their interests are essentially agricultural. Their usefulness to the rest of the world must lie in the fact that they possess the conditions which enable them to produce, for the non-tropical zones, indispensable articles of food, clothing and shelter. It must therefore be patent that the education of the inhabitants of this part of the world must have special reference to the interests of agriculture. This cannot mean that the standard of that education should be inferior to that of the dweller in countries where the chief occupation is the treatment of raw material, so that it may become more directly applicable to the uses of man. The agriculturist, as a matter of fact, has the means of true education closer to hand than the follower of any other kind of occupation. He is face to face with the direct results of the forces of nature. He is met with the responsibility of attaining a state of mind that can devise means of gaining a knowledge of those forces which will enable him to direct them in such a way as to be of the greatest value to mankind. Finally, to this end, he is provided with opportunities of observation and experiment which are without equal as a means of broadening his mental sympathies, and thus giving him the manner of true education. With these advantages, there should be no difficulty in making agricultural teaching and practice as efficient as those of any other branch of knowledge. It will supply a mental training that will produce the individual who takes a living interest and pride in his work, the more so as it provides him with a means of realizing that he is no longer the slave of routine, but the possessor of powers to originate and modify methods of procedure in ways which form the reflection of his own personality.

There are three broadly differing sets of circumstances under which instruction, either of an agricultural nature, or leading to this, must be given. These obtain in the primary school, in the secondary school, and, in the case where an agricultural training is continued after the pupil has reached an age when there is no longer any necessity for him to be subject to school discipline. In the primary school, the teaching will never be of a directly agricultural character, it will, rather, be of the essence of nature study, in order that the most useful and immediately applicable means of education may be employed, and that the mind of the pupil may become of use to him in the work that he will be called upon to do when he leaves school. The idea of nature study will obtain, as well, in the secondary school, but its scope will be widened, and it will show a closer connexion with the requirements of practical agriculture. In the case of a boy who goes on from this stage to the next, there is always, in a proper scheme of agricultural education, a transition period, during which he is still subject to disciplinary measures, while at the same time, he is given more freedom of action, and his work becomes of a more practical nature. It is at this stage that a cadetship at a Botanic Station, or, where this is provided, and where it is intended to take up the more advanced branches of agriculture, a course at an Agricultural College, becomes of use.

The third set of circumstances under which education in agricultural matters is received, is that which obtains while the recipient is actively engaged in the work of a practical agriculturist. This is not a time that has its distinct limit, like that of the conditions just described. It extends just as long as the agricultural work is being done. In other words, those who gain their livelihood from the soil require, more than any others, to be always ready to learn, and to seek opportunities by which their knowledge may be made greater. With the present progress in agriculture, it is very necessary that such individuals shall begin the acquisition of such knowledge under as favourable conditions as possible—that they shall be set in the right way, so that no time may be lost, and that their efforts to gain knowledge shall have the merit and use of orderliness. It is easily seen, in this connexion, that the Courses of Reading in Practical Agriculture, of the Imperial Department of Agriculture, have been devised for this very purpose. The steady pursuit of these will make it evident why the education of the practical agriculturist is never regarded as being finished, and why active sympathy with the work of his advisers is necessary to his best welfare.

SUGAR INDUSTRY.

EPIDEMIC SUGAR-CANE DISEASES OF THE PAST.

H. C. Prinsen Geerligs gives an account, in the *International Sugar Journal* for January of this year, of notable epidemics of diseases affecting the sugar-cane that have shown themselves in past years. He first draws attention to the passing, through disease, of the Bourbon cane in the West Indies—a matter which, it may be mentioned, has recent attention in an article by H. A. Tempany in the *West Indian Bulletin*, Vol. X, No. 1—and then suggests that, in addition to the adoption of the remedial measures recommended for checking those diseases, the fact that diseases possess cycles of activity may eventually lead to the resumption of the cultivation of this cane on a large scale. The account then goes on to treat of past epidemics of various pests, and forms the basis of the following information in connexion with them.

Records show that, as early as the year 1502, caterpillars of one or more kinds became such a serious pest of the sugar-cane in Madeira as to make it necessary to import sugar into that island, whereas it had formerly possessed a considerable export trade. A few years later, sugar was exported again, so that the insect or insects responsible for the damage must have soon ceased to exist in abnormal numbers.

The sugar-cane in Mauritius and Réunion was attacked to a serious extent in the year 1841 by a fungoid disease, and the matter became so important, in regard to the welfare of the islands, that canes were imported from Ceylon, with the hope that a variety resistant to the disease would be obtained. On their arrival, the canes were found to be infested with moth borer, and were ordered to be burnt; a few must have escaped destruction, however, as after that date, this insect pest was found in Mauritius. No further effort was made to introduce disease-resistant canes, and, notwithstanding this, the disease became much less severe, and two years afterwards the crops became healthy once more. It is suggested that, probably, some of the varieties cultivated in Mauritius were immune to the disease, while the others were very liable to its attacks, so that the power of the former to survive led it to take the place of the susceptible varieties.

In Java, during the year 1882, the cane variety which had, so far, sufficed in every way was attacked by a mysterious disease which threatened to exterminate it. The origin of this disease was never traced, but it was proved to be transmissible by means of cuttings. The disease spread throughout the island in a direction from west to east, but decreased in virulence as the area affected by it became larger, so that the attack was most serious in the first year. All ordinary direct remedies for combating it failed, and it was finally controlled by the careful use of sound cane tops for planting, by the introduction of new varieties of cane, and by the raising of fresh ones. Later, in 1900, some estates in Java were attacked by a fungoid disease, which was very promptly stamped out by adopting the policy of selecting for planting cane varieties that were resistant to it.

The rise of sudden epidemics may be explained, in some cases, by the fact that saprophytic fungi exist which become parasitic, for reasons that are not plain to be discovered, and then appear as very serious pests in relation to some variety or varieties of cane. The explanation of the sudden increase in the degree of parasitism shown in such cases may be either that the virulence of the fungus increases, or that the power of resistance of the affected varieties has decreased. In any case, it has often been noticed that a good cane variety has suddenly been seriously affected, while others remained quite untouched, and then that, after some time, the disease had died out. This last circumstance is interesting, but it is evident that planters cannot afford to wait for such an event; they must take measures which will be quickly effective in supplying them with good crops, and may do so by replacing the old varieties by new ones.

These considerations show that it is dangerous for any sugar-growing area to possess only one variety of cane. Not only, when that variety is seriously attacked, is time required for its replacement, but the planters are subjected to the danger of the hurried importation of canes which may bring new pests with them to a place where the natural parasites of these do not exist. This forms an argument on behalf of the policy of having varieties in reserve, which will be on hand for the purpose of replacing those that have become diseased, at the earliest possible opportunity.

ONIONS IN ANTIGUA.

The following report on the condition of the onion industry in Antigua has been received from Mr. T. Jackson, Curator of the Botanic Station in that island:—

During the last few years, the area of land planted in onions in Antigua has varied very slightly. For the present year (1909-10) it is about 58 acres. This area is larger by 8 acres and 6 acres than those of last year and the year before, respectively. During the present season, the crop has been particularly free from insect pests, and at the time of writing looks promising. The following table gives some figures that may be of interest:—

Year.	Seed imported, lb.	Area, acres.	No. of crates exported.	Value. £	s.	d.
1907-8	181½	52	3,505	850	11	0
1908-9	138	50	689	220	0	0
1909-10	181	58	..	...		

The great difference between the exportations for 1907-8 and 1908-9, without a corresponding decrease in the area cultivated, must not be taken as indicating a reduced return per acre, for the crop during 1908-9 was normal; the probable explanation is that the greater part of the latter crop was sold locally, while most of the onions produced in 1907-8 were exported.

The annual acreage under onions could be increased considerably in Antigua. They are grown as a catch crop with sugar-cane, and, under these conditions, when the land is cultivated early, they interfere very little with the routine work connected with the main crop.

On one estate in 1908, two plants matured seeds, the parents originating from seed planted that season. This is the second time that this somewhat peculiar incident has occurred in Antigua. (See *Reports on the Botanic Station, Experiment Plots and Agricultural Education*, Antigua, 1906-7, p. 39.) On the first occasion the seeds germinated, but the plants did not mature. At the present time, however, a fair number of healthy young plants, raised from this seed, are growing in the island.

In a later communication, Mr. Jackson states that six plants from the above-mentioned locally raised seed are forming fruit during this season, and suggests the possibility of the further transmission of the peculiarity of producing seed in one season to the progeny of these plants, so that annual varieties of the onion may be obtained ultimately.

WEST INDIAN FRUIT.

USEFUL FACTS REGARDING THE GROUND NUT.

Useful information in connexion with the ground nut has appeared from time to time in the *Agricultural News*, more recently in Vol. VIII, pp. 137, 206, 245, 315, 372 and 404, and Vol. IX, p. 4. An opportunity to supplement this has been afforded by the publication of Bulletin No. 21 of the Station Agronomique of Mauritius, from which the following information is taken. Special attention is directed to the tables, which should prove useful both to the grower of the plant, and to those by whom it is exploited commercially.

The suitability of the ground nut for a principal crop is doubtful, in many instances, but it may be cultivated as a catch crop with the certainty that it will be profitable. Under ordinary conditions, when it is grown on exhausted soil, with the aid of labour hired for the purpose—that is to say, under circumstances in which its produce has to pay all the expenses in connexion with its cultivation—the gains can be, at least, only contingent. It is more especially suited to be grown in this way on small holdings, where the family of the proprietor can give the plant attention during such times as its labour is not required for other purposes.

This is not so when it is employed as a catch crop, for in this case, part of its produce is not required to pay the rent of the land, as that portion of the latter on which it grows would not otherwise be occupied. To this is added another consideration, namely that, in its absence, such land would have to be kept clean, and in good condition, whereas once the ground nut plant had attained a reasonable development, it would cover the earth and prevent the growth of weeds. Cultivated in this way, the only special attention that it would require would be the preparation of the soil, the sowing of the seed, and the gathering of the fruits, and even these special attentions would improve the texture of the soil and favour the growth of the principal crop. Not the smallest among the benefits derived from its cultivation would be the enrichment of the soil in nitrogen, for it possesses the power to effect this, in common with all other leguminous plants. It is evident that, when the crop of ground nuts is harvested, part of this nitrogen, together with mineral matter that it has obtained from the soil, will be removed; but all these constituents will be restored to the soil, for the greater part, if the leaves and stems are returned as a green dressing, and there will be the further benefit in that its condition will be improved by the added vegetable matter.

Considering, now, the chief product of the ground nut, namely its oil, it is of great advantage if this can be used to supply a local market. If this is to be done, means for expressing the oil must be provided in, or near to, the districts where it is grown, in order that the former may be fresh, and thus not possessing the rancidity that it acquires on keeping, and which would render it unacceptable for local consumption. In this way, a better price would be obtained, for exported oil becomes rancid, and is then only fit for industrial purposes such as lubrication, the manufacture of soap, etc.

In considering the products of the ground nut, the cake which remains after the expression of the oil must not be forgotten. This is among the best of similar foods for stock, especially for feeding cows with a view to the production of milk. Where it is produced locally in quantity, its price varies with the amount that is on hand to be sold, and, weight for weight, it has a food value that is greater than that of the ground nut itself. Its commercial value serves to lower the expenses of the expression of the oil, and tends to make the cultivation of the plant itself more remunerative. In Europe, ground nut cake, together with linseed cake, obtains higher prices than all similar products.

Ordinary ground nuts, such as are sold by retail, have the composition shown in the following table. (In this and subsequent tables, the term albuminoids is used in a broad way, to include all nitrogenous substances, and starch, similarly, to mean digestible carbohydrates.):—

	Percentage composition.		Percentage composition of unshelled nuts.		
	Seeds.	Shells.	In seeds.	In shells.	Entire pods.
Water	6·34	9·80	5·03	2·26	7·29
Fibre	5·00	63·70	3·85	14·72	18·57
Fats and oils	47·90	0·70	36·84	0·16	37·00
Starch	11·62	19·59	8·92	4·53	13·45
Albuminoids	26·54	3·81	20·41	0·83	21·29
Ash	2·40	2·40	1·85	0·55	2·40
			76·90	23·10	

In the above example, the unshelled nuts contained 76·90 per cent. of seeds. This proportion varies from 73 or 74 to 78 or 80 per cent.; 75 per cent. may be considered to be an average proportion. This figure is the one that is usually employed commercially, in order to estimate the quantity of seeds that will be provided by a given weight of unshelled nuts.

The mineral matter of the seeds is characterized by a high content of phosphoric acid and potash; more than two-

thirds of the total ash is composed of these substances. Both silica and iron oxide, as well as alumina, are found in considerable amounts in the shells, but these are mainly present in the soil which adheres to them; the proportions in which they actually occur in the shells themselves are small.

With particular reference to the oil content, analyses made at Marseilles have given 42 to 45 per cent. for Mozambique nuts, and 37 to 38 per cent. for those from Bombay. Analyses conducted at the station with five samples of Mauritius ground nuts have given the following average percentages of oil: shelled nuts 44·56 per cent., unshelled nuts 34·26 per cent.

In the matter of the extraction of the oil, a percentage of 28 to 32 is obtained in Europe, after three separate pressings, one of which is conducted with the aid of heat. The following table gives particulars as to the percentage composition of four samples of the cake left after pressing. Samples 1 and 2 were Mauritius cakes, pressed hot; sample 3 was a cake from the same source, pressed cold; sample 4 was a cake left after extraction by pressure with heat, in Europe:—

	No. 1.	No. 2.	No. 3.	No. 4.
Water	15·20	13·26	14·40	11·50
Fibre	8·05	8·35	4·34	5·20
Fats and oils	8·08	7·90	17·80	7·30
Starch	20·42	22·51	19·20	24·10
Albuminoids	40·31	40·12	38·00	47·00
Ash	7·94	7·86	6·26	4·90
Nitrogen	6·45	6·42	6·08	7·52

As regards the vegetative part of the plant, analyses of the stalks gave the results shown in the following table. Sample 1 was taken from plants grown between rows of sugar-cane; these gave about ½-ton of vegetable matter per acre. Sample 2 was obtained from plants grown in the open; these yielded about 5 tons of vegetable matter per acre. In the former case, the stalks were half dry and the leaves had all fallen; in the latter, the stalks had not dried to such an extent and still bore the greater part of their leaves:—

	Percentage composition.		Percentage after drying.	
	No. 1.	No. 2.	No. 1.	No. 2.
Water	69·40	75·50	...	.
Fibre	14·37	9·82	46·97	40·10
Fats and oils	0·41	0·42	1·35	1·73
Sugar	..	1·22	...	5·00
Starch	9·13	8·33	29·80	33·64
Albuminoids	2·41	2·44	7·88	10·25
Ash	4·28	2·27	14·00	9·28
Nitrogen	0·39	0·39	1·26	1·64

Trade Between Canada and the West Indies.

At a special general meeting of the Agricultural and Commercial Society of Grenada, held on the 4th ultimo, the following resolutions were passed: (1) That in the opinion of the Grenada Agricultural and Commercial Society, it is highly desirable that better trade relations with Canada should be established, and that an indispensable first step to encourage such better relations is the provision of satisfactory steam communication. (2) That the Grenada Agricultural and Commercial Society is prepared sympathetically to consider any preferential arrangements which may be proposed by the Government of Canada.

THE PERINI FIBRE PLANT.

Accounts of the industrial importance, and of the botanical affinities of the Perini Fibre Plant (*Hibiscus radiatus*) have appeared already in the *Agricultural News*, Vol. VIII, pp. 235 and 375. Through the courtesy of H.M. Consul General for Brazil, a copy of a pamphlet relating to this plant, published in 1905, has been received. From this, the following information regarding its cultivation is extracted:—

Although the best time for sowing is November, planting can be done at any time of the year. At whatever time the sowing takes place, however, when the time for gathering the crop arrives, the plants should be cut about 4 inches above the soil, and the stumps will readily shoot again and allow of a second, and even a third crop, being gathered in one year.

To attain this end, the plantation should be divided thus:— (1) A smaller crop merely for seeds. (2) A large plantation for industrial purposes.

For the first, the land should be prepared in September to October, and the sowing done in November. Naturally, for an extensive cultivation, ploughs will be required, and the beds must be properly measured and prepared, twenty-five seeds being sown to the square metre. The plant thus has space to grow freely. Great care must be observed to keep the seed-beds clean, and to avoid cross-fertilization with useless weeds, so abundant in this country. This is absolutely necessary, if the seed obtained is to give the best possible results. Four months later, the first seeds should be gathered by hand, and the crop of the second flowering is left to dry on the plant. No part of this crop need be lost, but the fibre extracted after flowering is naturally coarser than if gathered previously.

For a large crop destined for industrial and textile purposes, machinery must be employed. In the first year, the ploughing and preparation of the land represent a considerable expense. Three operations are commonly necessary, clearing the brush-wood and trees, etc.; digging up the roots and draining; sowing, in November, 2 grammes of seed per square metre, equivalent to 100 seeds per square metre.

The plant grows rapidly, with only one stem, not having space to branch out. The stem will reach 3 or 4 metres high. The facts of placing the plants close together, and of starving them, are all in favour of the quality of the fibre, which is thus produced much finer and of a silky appearance.

It should be cut before flowering, that is in February, or 90 to 100 days after sowing. During this short period, the plant attains a height of at least 3 metres. Thus we have a harvest in February, another in June and another in October—when it will be necessary to dig up the roots and plough and prepare the land for the new sowing in November.

In a letter forwarding the pamphlet, H.M. Consul General says that the most conflicting statements have been made from time to time as to the potential value and local production of the plant, and that it is not being grown locally to any extent. He states further that, according to well informed sources, its cultivation in Brazil has not been very successful, so far.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 14, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 300 bales of West Indian Sea Island cotton have been sold, including Barbados $17\frac{1}{2}d.$ to $20d.$, St. Kitts $18d.$ to $20d.$, Montserrat $17\frac{1}{4}d.$ to $19d.$, Nevis $18d.$, St. Croix $18\frac{1}{2}d.$, and St. Vincent $20d.$

Prices are firm, and are likely to remain so, owing to the high prices ruling for Egyptian cotton, the crop of which has been a failure this year.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 11, is as follows:—

There was only a moderate demand throughout the week, which was limited to Fine and Fully Fine, off in preparation, at 30c., Stained and Tinged at 28c., and deep Stains at 27c., resulting in sales of 300 bales in all, which are being shipped to Savannah and warehoused there.

However, since the Exchange report, large sales have been made of Fully Fine and Extra Fine, at some concession from previous asking prices, the buying being for export.

We will give details in our next report.

COTTON SEED SELECTION IN THE UNITED STATES.

Cotton-growers are by this time familiar with the methods of cotton seed selection that have been advised for adoption in the West Indies. The following extracts from a leaflet, just issued by the Bureau of Plant Industry of the United States Department of Agriculture, and entitled *Distribution of Seed-Cotton in 1910*, will serve to show that these methods are similar to those in vogue in that country, and to give some points of further interest in connexion with the matter. Among these, the planting of seed from selected plants in what are termed 'progeny rows' appears to be specially useful:—

Two methods of cotton seed selection have been used in the past—'mass selection' and 'individual selection'. In the first, the planter picks enough of his best plants to furnish seed for his next year's planting. This may be done by his most experienced picker, or by the planter himself, and the amount of seed-cotton thus selected is sufficient to be ginned at the ordinary customs gin. The gains by this method are ample to pay for the expenses incurred, and in the hands of an exceptional man, may give very good results; but they are not so sure, or so rapid, as those by individual selection.

In individual selection, the planter takes greater care in selecting his plants, and instead of picking all the selections together, he numbers each plant by a tag, and picks the seed-cotton into a bag numbered correspondingly.

This seed is planted in separate rows during the next year. The plot selected for this work should be as uniform as possible, and of high fertility. The seed will have to be sown by hand. It is not necessary to delint it, but it is well to immerse the seed-cotton in water, just before planting. If half a lock of this wet cotton is dropped every 2 feet in the row, and covered with an inch or two of loose soil with the feet, and then trodden upon, a good stand is almost certain. These rows should be given the same numbers as the parent plants, and are called 'progeny rows'.

The reason for planting in progeny rows is that not all good cotton stalks have the power to transmit their qualities to their progeny. In other words, a good stalk may be so by inheritance, or it may be really very ordinary, owing its good qualities to some advantage in soil, fertilizer, or cultivation, which neighbouring plants have failed to get. Probably no one ever becomes well enough acquainted with cotton to be able to recognize this distinction in any given case.

A surprise is in store for the man who plants, in progeny rows, the twenty-five best plants he can find, this surprise consisting, firstly, in the apparent uniformity of the plants in each row; and, secondly, in the wide variation between those in adjacent rows. By this means, one is enabled to discard all the progeny of those plants which fail in any character. Without progeny rows, it is impossible to eliminate these undesirable plants so thoroughly.

To select for productiveness, plants which have given a larger yield than their neighbours, without any evident advantage as to soil, space or fertilizer, should be chosen. The poorest part of the field is just as good for this selection as the best, except that, among the stunted plants on poor soil, the individual differences do not usually show so plainly as where the cotton plants have made a better growth. The cotton stalk which has ripened eight bolls, while the neighbouring stalks, with the same apparent opportunity, ripened five, is as much to be selected for productivity as the one having forty bolls among plants bearing twenty-five.

In making selections for greater length of lint, it is well to have a comb on which a $2\frac{1}{2}$-inch scale, divided into sixteenths, is marked. The lint is combed out on the seeds, and enough is then pulled off to be measured on the scale. The lint should be of uniform length all over the seed. Sometimes the lint is shorter on the pointed end, which defect is important, as it makes more waste in the process of spinning.

The percentage of lint cannot be accurately determined, for individual plants, without scales which are fairly delicate in adjustment. Variation in percentage of lint may be judged with sufficient accuracy by noting the density and completeness of the covering of the seed. If the yield of seed-cotton is the same, of course, the variety with a higher percentage of lint is more valuable.

HALF-YEARLY EXAMINATION OF AGRICULTURAL SCHOOLS.

The following are the general reports of the examiner (Mr. F. W. South, B.A.) on the recent half-yearly examination of the pupils at the Agricultural Schools in Dominica, St. Vincent and St. Lucia:—

DOMINICA AGRICULTURAL SCHOOL.

Twenty boys sat for this examination. Of these, four were seniors, fourteen juniors, and two were new boys. The average percentages of marks obtained were as follows: Seniors 68, juniors 50, new boys 42. The standard of the work of the seniors is satisfactory, but the new boys and juniors show considerable falling off since the last examination. Paul was the best of the seniors, and there were several fair papers among the juniors.

All the subjects were rather weak, but the following require special and very careful attention: Geography, Arithmetic, among the juniors, English Grammar and Composition, Spelling and Writing. The use of sub-heads, and of very short and simple sentences might improve the Grammar and Composition. It would be advisable, from the point of view of general neatness, not to allow the boys to use red ink, nor to underline the headings on their papers too freely. Plenty of room should be allowed for each question, and the answers to them should not be separated by ink lines. It is only necessary to leave a space of a line or two on the paper. If these points are attended to, the general appearance of the papers will be considerably improved.

ST. VINCENT AGRICULTURAL SCHOOL.

Nineteen boys sat for this examination. Of these, four were seniors, eight juniors, and seven were new boys. The average percentages of marks obtained were as follows: Seniors 80; juniors 58; new boys 52. The seniors again did well, though all these averages are below those obtained in the last examination, especially in the case of the juniors, where the falling off is rather marked. Derrick was the best of the seniors, and Doddrige Davis of the juniors, while Otto Haines and Bradshaw also did fairly well in this class. Howard Denbar's work was very poor, and he will require the most careful attention.

Some good papers were shown in all subjects. Any special weaknesses are mentioned in the detailed reports. Chemistry and Botany show room for improvement, and Arithmetic also, in the case of the juniors; among the seniors, this subject was very good. The Composition was not so good as that of the last time, and the Spelling of the new boys requires attention. The papers were very neat, but none of the boys put their class or the name of the school at the head of them

Though there is some falling off in the results, as compared with those of the last examination, it is clear that the pupils are receiving very careful attention, and are being trained in good methods.

ST. LUCIA AGRICULTURAL SCHOOL.

Fifteen boys sat for this examination. Of these, one was a senior, eight were juniors, and six were new boys. The average percentages of marks obtained were as follows: Seniors 78, juniors 75, new boys 69. These results were quite satisfactory, and show a slight improvement on those of last time. Moise, Munrose and Mason did well among the juniors, and Angier, of the new boys.

The standard in all the subjects was very fair, with the exception of that of the new boys' Dictation, Composition among the juniors, and Geography throughout. Arithmetic and Agriculture were the best subjects; the former, in particular, was very good. The writing was good, and the papers neat, but diagrams and maps still require attention. English Grammar and Spelling show considerable improvement.

In general, the results are very satisfactory, and show that the pupils are receiving accurate and careful instruction.

THE PRODUCTION OF ALCOHOL IN THE PHILIPPINES.

Besides rice, Indian corn and sugar-cane, the available sources from which alcohol can be manufactured in this archipelago are the sap of many palms and the cassava. At present, nearly all the alcohol produced comes from the bled sap ('tuba') of the Nipa and other palms. Alcohol from the Nipa has a disagreeable odour, which is somewhat difficult to remove, but for industrial purposes this would be of no consequence. A description of this palm (*Nipa fruticans*, Wurmb.) may be found in many places. It is a species widely distributed all the way from India to Malaya, in Northern Australia, and Polynesia. A very detailed study of the culture and bleeding of this plant has been published by Ayala & Co.

The production of tuba from a mature tree usually increases during the first fifty to sixty days after tapping, and decreases during twenty-five to thirty days more. If tuba is drawn for a longer period, the tree will die. The tuba from mature stems is white, has an aromatic odour, and is sweet. That from palms having less mature fruit is bluish and less sweet, and, therefore, has less fermentative value. The average yield per tree fluctuates from ½-litre to 3 litres per day, with a total of from 30 to 40 litres (sp. gr. 1·07 to 1·08 at 15°). The juice contains approximately 12 per cent. of fermentable material, which is largely saccharose. Thirty-two to 34 litres of tuba will usually produce 1 litre of pure alcohol. In the provinces of Bulacan and Pampanga, where the price of the molasses residues from sugar-cane is low, these are mixed with the tuba before fermentation, when the mixture is said to give a larger yield of alcohol than would be obtained from the two, if they were fermented separately.

Alcohol is removed from the fermented tuba by distillation. The method used in the provinces produces a distillate containing about 50 per cent. of alcohol. By redistilling a sufficient number of times, a 95-per cent. alcohol might be produced, but the process would be very expensive; therefore, the crude alcohol is shipped to the large distilleries in Manila, where it can be refined more economically. In the latter, the process is continuous; the vapours pass through several stills, and are cooled just sufficiently to condense them in each one, until the proper purity is reached. It will, therefore, be seen that after an alcohol once passes the crude 50-per cent. stage, a purity of 95 per cent. can be produced with very little more expense per proof litre than for that of one of lower grade. The economy of the purer form is obvious.

The manufacture of alcohol from tuba is rather expensive, and it is doubtful if the process could be greatly cheapened. (*Philippine Agricultural Review*, November 1909.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

VOL. IX. SATURDAY, MARCH 5, 1910. No. 205.

NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial deals with the problem of agricultural education in a general manner. The subject will be continued, in a more detailed way, in the next number of the *Agricultural News.*

An abstract of an interesting article on epidemics of disease of sugar-cane that have taken place in the past appears on page 67.

Useful facts regarding the ground nut will be found on page 68. They are intended to supplement the information that has been recently given already concerning this plant.

A note on the Perini fibre plant is presented on page 69.

The general report on the recent examination of the Agricultural Schools in Dominica, St. Vincent and St. Lucia appears on page 71.

The first of two articles on carbon bisulphide that will appear under the heading Insect Notes is given on page 74.

The article under Fungus Notes (page 78) is the first of a series that it is intended to publish, on the chief groups of fungi. These should be read in connexion with those on the life-history of the fungi, that have appeared already.

Publications of the Imperial Department of Agriculture.

Pamphlet No. 62 of the Department Series has recently been issued. It contains an account of the experiments with seedling canes, and of the experiments in the manuring of canes, conducted in Barbados during 1907-9. A review of this pamphlet is given on page 75.

A review is also given, on the same page, of the latest pamphlet to be published in that Series (No. 63). This deals with the experiments that have been conducted with seedlings and other canes in the Leeward Islands, during 1908-9.

These pamphlets can be obtained of all agents for the sale of the publications of the Department; price 6*d.*, post free 7½*d.*

West Indian Seedling Canes in Queensland.

The ninth *Annual Report of the Bureau of Sugar Experiment Stations,* Queensland, has just been received through the Secretary of State for the Colonies. Among the experiments of which results are recorded is a number which were conducted with the ten best varieties of sugar-cane from different countries, in order to determine their respective agricultural and commercial values. Among these, T. 60 holds a fairly high place, being fourth on the list. On irrigated land, with mixed manures, this gave 149 tons of cane per acre, for four crops. On similar land with no manure, the yield was 147·5 tons for the same number of crops. The similar figures for land not under irrigation were 126 tons and 124·7 tons.

B. 208 has, in general, shown a tendency to become diseased, but will be given a further trial, 'owing to the splendid record this cane has in some parts of Queensland, and also in its own country, the West Indies.' Among the canes which are to take part in new experiments that have recently been initiated is B. 147.

An account is given of the behaviour of various kinds of cane in the presence of a gumming disease which is said to be due to *Bacterium vascularum.* Among West Indian canes, D. 95 has shown itself susceptible to it; while, although in the trials made with D. 74 and T. 202, no gum was found, all the canes died.

An African Fibre Plant.

In the *Kew Bulletin,* 1906, p. 397, mention is made of an African fibre plant, *Gomphocarpus semilunatus,* under the name *Asclepias semilunata,* stating that samples of the fibre of this plant had been received, and forwarded to the Imperial Institute for examination. The results of the examination, which are contained in the *Bulletin of the Imperial Institute,* Vol. 3, p. 316, showed that the fibre was of good quality, but that there were indications that it may not be very durable, and it is suggested that improvement may be effected by careful preparation.

Further information concerning this plant is contained in the *Agricultural Bulletin of the Straits and Federated Malay States* for December last. In a description which is given of the plant, it is stated that the stem is straight and unbranched, which is an important matter in a fibre plant. The diameter of the stem is about ¼-inch, and it bears numerous lanceolate leaves. The flowers, which are white with a grey-violet corona, are borne in bunches near the top of the stem. The suggestion is made that the plant would do well in regions where other similar fibre plants show a tendency to form branches low down on the stem. In cultivation, it requires to be sown in good, open soil, and may be cut in about six months. Fibre, recently sent from Uganda, was valued at £35 a ton, so that this would make it appear that the plant is worth the attention of those interested in fibres.

Sisal in Mauritius.

The *Rapport Annuel de la Station Agronomique de l'Ile Maurice*, 1906-7, states that, in this island about 40 tons of sisal leaves (*Agave rigida*, var. *sisalana*) are required to produce 1 ton of dried fibre. The plant is grown by the owners of the decorticating factories; this is partly because production of the plant by others is discouraged by the circumstance that the price paid for the leaves remains the same, whatever the market conditions may be. It is suggested that the manufacturers should offer intending cultivators a price which is remunerative, and proportional to the state of the market for the fibre. This will probably have the result of extending the cultivation, of causing greater care to be taken in growing the plant, and of reducing the expenses in connexion with the separation of the fibre.

The South African Pipe Calabash.

References to the gourd (*Lagenaria vulgaris*) which produces the fruit used in making the calabash pipe have been made several times in the *Agricultural News*, and trials with seeds of this plant from South Africa have been conducted by the Department. The plant itself is a native of all tropical countries, and has been introduced into the Southern United States.

Circular No. 41 of the United States Bureau of Plant Industry, dealing with this plant and the manufacture of pipes from it, has been recently issued. In this, the reason for the high prices that have to be paid for these pipes is given by saying that the crook of the calabash naturally varies in shape, so that each mouthpiece must be made to fit it, and each lining of meerschaum, or of plaster of Paris, must be specially adapted. The discovery of the use of the calabash as a pipe bowl is attributed to the Boers.

In growing the vine for the sake of its fruits, according to this circular, it should be allowed to trail over the ground, and it seems to induce a more perfect neck if the gourds are made to stand up, when half grown, so that they rest on their larger ends; care is required in doing this. It was not found that the ability to acquire a crooked neck is an inherited quality. The gourds should not be picked green, but must be left as long as possible on the vines, in order that they may become thoroughly hard. The plants thrive well in rich soil, especially if this is composed of a loam containing plenty of organic matter, which has received a dressing of well rotted pen, or stable, manure.

In the circular referred to, a method is given for causing the neck of the calabash to assume any required shape. This consists in carefully laying the young gourd, before its neck has hardened, on a board, and causing it to assume the required shape by means of pegs thrust into holes that have been pierced in the board very close together. As the fruit grows, the pegs will require to be reset in such a way as to cause the attainment of the desired shape.

It is stated that the prices paid for the fruits by the manufacturer are very low, and that the demand is limited; so that the raising of the gourd on a large scale is not advised.

Swiss Milk Goats.

The efforts that have been made in Europe to improve the goat for milking purposes have met with such success that the matter deserves general attention. The *Transvaal Agricultural Journal*, Vol. VIII, No. 29, states that the best milking goats are the Swiss Saanen breed, the ewes of which are now reported to yield at least a thousand bottles a year, that is at the rate of six or eight bottles of milk a day. It goes on to draw attention to the fact that goat's milk may be prevented from possessing the smell which so quickly distinguishes it from that of the cow by stabling the ram at a distance from it, and mentions that goats of this breed naturally require more care than is usually given to the commoner varieties of this animal, if it is desired to obtain a large quantity of milk from them.

Passages are quoted from a report of the Director of the Stud Farm, Hessen, Germany, which states that ewes of this race if well developed, are ready for breeding purposes at the age of six months. The milking of the ewe is suspended for four to six weeks before the kids are born, to the benefit of both the mother and her offspring. After the birth of the latter, the ewe should be provided with good grazing, or with hay, but should be prevented (as for goats in general) from drinking too much cold water. The milk production is greatly increased if bran is fed.

An average analysis of the milk from 100 goats is given, and is compared with the average analysis of cows' milk, in Germany. This shows that goat's milk is considerably richer in fat (4·78 per cent. against 3·40 per cent.) and proteids (4.29 per cent. against 3·50 per cent.) than that of the cow; while it is slightly poorer in milk sugar (4·46 per cent. against 4·60 per cent.).

In order to improve the breed of goats in Holland, the Netherlands Department of Agriculture has recently imported animals of the Saanen race. These were not obtained directly from Switzerland, but from Hessen, where pure breeding of the race has been conducted for many years.

It would appear that this breed of goats may possibly be worthy of attention in the West Indies.

INSECT NOTES.

CARBON BISULPHIDE.

PART I.

Mention has frequently been made, in the publications of this Department, of carbon bisulphide and its use, particularly as an insecticide. In the *Agricultural News*, Vol. I. p. 140, there is to be found a brief article dealing with this substance, and in more recent publications it has been mentioned in connexion with various experiments that have been carried out.

An objection that has always been raised to the use of carbon bisulphide in the West Indies is the difficulty of obtaining it, since from its volatile and inflammable character, most transportation companies do not like to carry it, and also because the only form in which this material is supplied is a comparatively pure product sold by the druggists. At the present time, however, supplies can be obtained at fairly reasonable cost, as will be shown later in this article.

One of the most complete publications setting forth the uses, properties and history of carbon bisulphide is *Farmers' Bulletin* No. 145, of the United States Department of Agriculture, issued in 1902. Johnson's *Fumigation Methods* (1902) also contains a very comprehensive chapter on fumigation by carbon bisulphide.

PROPERTIES. Carbon bisulphide is a colourless, heavy liquid, which is prepared on a large scale by passing the fumes of burning sulphur over red-hot charcoal, and condensing the resulting vapours to liquid form by cooling. This liquid is one-fourth heavier than water; it is very volatile, evaporating freely when exposed to the air. The rapidity of evaporation is proportionate to the extent of the exposed surface, as well as to the temperature and the amount of movement of the atmosphere above; evaporation in partially closed vessels may be prevented by covering the carbon bisulphide with a layer of water. The water being lighter, floats on the surface of the carbon bisulphide, in the same way that kerosene floats on the surface of water.

The vapour of carbon bisulphide is 2·63 times heavier than air. It diffuses quite rapidly through the air, but its tendency is to penetrate downwards faster than upwards, and this characteristic of the gas has an important bearing on its use in certain conditions.

In the general use of carbon bisulphide as an insecticide, there is no fear of injurious effect to the operator, if ordinary care is taken. If considerable quantities of the vapour were to be inhaled for a long time, serious results would follow. A greater danger is that of explosion. Carbon bisulphide vapour is very inflammable, and in an atmosphere impregnated with this, an explosion may easily be brought about by the slightest spark, or even by a rather warm surface, and the greatest care should be taken that no fire or flame, even of a pipe or cigar or cigarette, is brought into contact with this vapour. The risk attending the use of carbon bisulphide is not greater than that attending the use of gasoline, in many ways.

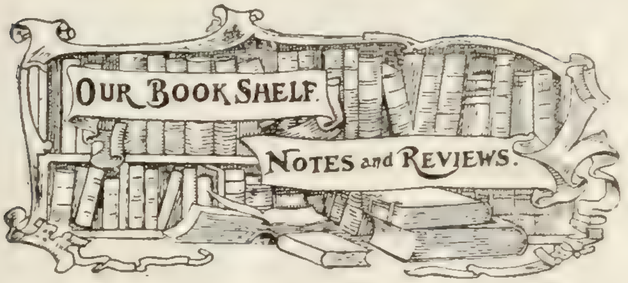
Carbon bisulphide was first used as an insecticide in 1856-7 in killing weevils and their eggs in grain, and later, in 1859, it was employed in the control of phylloxera on the grape vines of southern France. By 1873, over 200,000 acres of vines were receiving annual treatment with carbon bisulphide. Since that time, it has come to be very generally used in connexion with certain kinds of pests.

MODE OF APPLICATION. From the fact that success in the use of carbon bisulphide depends on the ability of the user to confine the vapour, this substance has its greatest utility in connexion with those insects which live in the ground, and in stored grains and other products. As a means of control of those insects which attack stored vegetable products, carbon bisulphide has been found extremely useful in fumigating mills, granaries and warehouses, and it has a further application for the fumigation of foodstuffs, books, clothing, etc., in households. In fumigating mills and similar buildings, 1 lb. of carbon bisulphide to every 1,000 cubic feet of space is the amount generally used. In employing it for the purpose, it is necessary to apply the vapour at the top of the bin or box in which the materials are to be fumigated, and in the case of buildings or rooms, the carbon bisulphide should be exposed as high above the floor as possible. Shallow tins, or plates, are suitable for exposing the liquid, since the evaporation is very rapid, in proportion to the increased surface, and at least 1 square foot of evaporating surface should be calculated for every 25 square feet of floor space. The building that is being fumigated should be closed, if possible, for twenty-four hours, and no one should enter it, or bring into the immediate neighbourhood of it, any fire or flame of any kind. In fumigating material in boxes, bins, barrels, or other comparatively small containers, carbon bisulphide should be exposed in a shallow dish at the top. The carbon bisulphide should be used at the same rate, namely, 1 lb. per 1,000 cubic feet, as is already suggested for the fumigation of buildings. A suitable proportion is 1 lb. to 100 bushels of grain. This is a somewhat stronger dose than 1 lb. to 1,000 cubic feet, but it does not injure the germinating power of seeds, even at that strength.

For the destruction of ants, carbon bisulphide has been successfully used, by pouring into the nest 1 or 2 oz. of the liquid, in several doses. This can be accomplished by making holes with an iron stake, or a stick, and when the carbon bisulphide has been poured in, securely closing the holes. In the same way, it may be used, at the rate of 1 oz. per square yard, for the control of grubs and mole crickets in soils; it has also been successfully employed in the treatment of root maggots attacking garden plants, and of burrowing animals, such as squirrels, gophers, woodchucks, moles, mice, etc.

COST. Carbon bisulphide may be obtained from several makers. It is sold by Edward R. Taylor, Penn Yan, New York, U.S.A., under the trade name of 'Fuma'. This brand is prepared specially for use in fumigating, and its price is very reasonable. The Imperial Department of Agriculture has recently received a trial shipment, and Messrs. Knight & Co., General Druggists, Barbados, have a supply on order which should be available soon. Druggists generally carry in stock limited supplies of carbon bisulphide in small tins, but in this form the cost is rather high for fumigation, on a large scale, the retail price being something like 1*s.* 6*d.* to 2*s.* per lb. 'Fuma' carbon bisulphide, on the other hand, costs only about 10c. per lb., with containers (which are screw-capped iron drums), carriage, and duty, extra. These extras, with the profits of the local dealer, will increase the cost very materially; but, even then, Fuma carbon bisulphide ought to be available for use in the West Indies at a price sufficiently low to warrant its employment on a large scale, if experiments show that beneficial results follow its use.

As is stated above, the objection has often been made that steamship companies did not like to handle such inflammable material, but there seems to be no great difficulty at the present time; at any rate, recent orders were filled very promptly.



SEEDLING CANES AND MANURIAL EXPERIMENTS AT BARBADOS, 1907-9. Issued by the Imperial Commissioner of Agriculture for the West Indies.

Pamphlet No. 62 of the series published by the Imperial Department of Agriculture has been recently issued under this title. It contains, in a concise form, the results of the experiments that are described at length in the Report on the results of the cultivation of seedling and other canes, together with manurial experiments with sugar-cane, carried on at the experiment stations at Barbados, during 1907-9, which is soon to be published.

The matters dealt with first are the mode in which the experiments are carried out, together with an explanation of terms used in the text; the characters shown by the seedling canes in the field and in the factory; a description of the stations at which the experiments are conducted; and an account of the climatic conditions which obtained during the season under review. This introductory information is followed by a section which deals with the more important results that have been obtained with the varieties cultivated. After an explanation has been given to the effect that these results only afford the means of drawing temporary conclusions from one year's work, it is shown that the best returns, on the black soils, have been obtained with B.3,013, followed by B.6,381, and B.6,450, though, in justice to the last mentioned cane, it is explained that it would probably have occupied an even better position, but for the fact that it met with untoward conditions on several of the stations on which it was grown. A similar analysis of the results given on the red soils presents B.208, B.3,405 and B.3,412, in order of merit, as regards yield of sucrose from plants. As plants and first and second ratoons, on these soils, the order is B.376, B.3,390 and B.3,412.

Tables are given for the purpose of demonstrating the above results, as well as to put forward the returns that have been obtained during the past five years. In the latter connexion, on the black soils, the first place is taken by B.6,204, which however has been grown for four years only, followed by B.6,450, B.3,747 and B.5,353. On the red soils, the order is B.3,405, B.3,412 and B.3,390; but, as plants and first ratoons on these soils, B.3,412 occupies the first position, followed by B.3,390 and B.3,405, in succession.

The next section gives detailed information in regard to the selected varieties for 1909. This is followed by an exhaustive treatment of the subject of the conditions and results relating to the different varieties, on the various experimental stations, grown as plants and ratoons. The subject is dealt with mainly by the aid of tables, and as it is concerned with the individual behaviour of canes on different stations, no generalizations can be put forward. Each part of the tables requires to be studied in its particular application. Interesting information as to the incidence of root disease (*Marasmius sacchari*), during different years, is given.

The remainder of the pamphlet is concerned with the results of the usual manurial experiments that have been carried out at the station at Dodds. These continue to indicate the response of the sugar-cane to the use of nitrogenous manures, and the fact that the application of phosphates has resulted in a decrease, rather than an increase, in the yield.

SEEDLING AND OTHER CANES IN THE LEEWARD ISLANDS, 1908-9. Issued by the Imperial Commissioner of Agriculture for the West Indies.

This is the title of Pamphlet No. 63 of the series published by the Imperial Department of Agriculture. It presents, in a concise form, the results of experiments, conducted in Antigua and St. Kitts with seedling canes, which are dealt with at length in the Official Report on Sugar-Cane Experiments in the Leeward Islands (Part I, 1908-9), soon to be issued.

The first matter to claim attention is the mode in which the experiments are carried out; this is followed by a table giving, in a concise manner, the chief characters of the canes with which the investigations were made. The rest of the publication may be divided into four parts: those dealing directly with Antigua and St. Kitts, respectively, and two appendixes, the first relating to the area under cultivation in cane varieties at a large number of estates, in both islands, and the second to the average yields from each experiment station, in the two islands, during the past eight years.

The great increase that has taken place in the number of seedling canes available for experiment has caused twenty-six of the most promising of the newer Demerara and Barbados varieties to be included in the investigations at all stations in Antigua, in addition to sixteen of the varieties that have proved their value in the past. The scheme of experimentation has therefore been modified, so that the trials are no longer conducted in duplicate, in order to give room for their extended scope, and the result is that, for this island, particulars are given of the yields obtained with forty-two varieties, at eight stations, on single plots. In St. Kitts, the number of stations was the same as in Antigua, while that of the varieties was twenty-three.

In the case of Antigua, a discussion is given of the relation between the effect of the root disease and the past history of any given stool of canes as regards soil conditions. In the matter of disease, too, it is mentioned that the rind disease (*Trichosphaeria sacchari*) has produced rotten cane, to a small extent, on some of the experiment stations.

In the appendix which deals with the areas of the different kinds of sugar-cane under cultivation on the majority of the estates, it is shown that Sealy Seedling, in Antigua, has given the largest increase, although White Transparent, including all its related varieties, holds the premier position, but with a decrease in acreage from that of the preceding season. This decrease has been taking place during several years, and it will probably be greater in the future, as the proved susceptibility of this cane to root disease causes it to be replaced by newer varieties. The cane mostly grown in St. Kitts is B.147, and the statement is made in regard to it: 'There is a growing tendency to regard this cane as particularly well suited to the fertile lands supplied with a good rainfall..., but as not so well adapted to the drier conditions...of the island.'

The second appendix should prove specially useful to the planter, as it assists him to make a direct application of the results obtained at the experiment station where the conditions are most nearly similar to those of his estate, and thus to choose those canes for cultivation that are likely to give him the best yields.

GLEANINGS.

On account of unfavourable weather conditions in Cuba, it is estimated that the sugar crop will be between 1,400,000 tons and 1,600,000 tons; thus the output will not exceed that of the previous season.

An estimate of the Egyptian cotton crop for the season 1909-10 gives it as about 544 million pounds, from 1,600,000 acres, valued at £22,000,000. In the preceding season, the similar figures were, approximately, 678 million pounds, 1,600,000 acres and £20,000,000.

Messrs. C. J. Dams & Co., of 121 Newgate Street, London, E.C., have recently brought out glass cups for rubber collection. These are of different registered patterns and sizes, in white and dark green glass, and are adapted for collecting either at the base of the tree, or on the trunk.

The number of bales of cotton imported into the United Kingdom during the fifty-two weeks ended December 30, 1909, was 4,200,742. This included 6,358 bales of British West Indian, 12,715 bales of British West African, 11,702 bales of British East African, and 326 bales of Foreign East African, cotton. (*Board of Trade Journal*, January 6, 1910.)

According to the *Manchester Courier* the quantities of West Indian bananas sent during 1909 to Manchester, Bristol and Southampton, were 1,937,548 bunches, 1,935,001 bunches, and 122,231 bunches, respectively. Of Canary bananas, during the same period, Liverpool received 1,715,000 bunches, and London 1,441,936 bunches.

At the ceremonies which took place in connexion with the celebration, at Bray, of Arbor Day in Ireland, on November 6 last, his Excellency Lord Aberdeen laid special stress on the need for more extensive tree-growing in Ireland, and insisted on the advantages to be gained from the planting of both ornamental and economic trees.

An advance prospectus has been received of the Manchester Industrial Exhibition, which is to be held in the Manchester Exhibition Buildings from May 12, 1910, to June 25, 1910, inclusive. Inquiries concerning this should be made to: The Organizers, The International Trade Exhibitions, Ltd., Broad Street House, London, E.C.

The increase in the home consumption of dairy products in Canada is beginning to cause a lessening in the quantity of these that is exported. This is shown by the fact that the values of such exports in 1908 was £3,955,696, while in 1909 it was £3,721,199. In the former year, as compared with 1907, there was a decline of £484,299, and with 1906 of £1,695,267, in the value.

According to the *West India Committee Circular*, at the Colonial Fruit Show recently held in London, the campaign for popularizing limes, initiated by the Dominica Permanent Exhibition Committee, was furthered by the presentation, to each visitor, of samples of the fruit in bags on which the words Dominica Limes appeared conspicuously in bold letters, a unique advertisement of the product being thus obtained.

It is stated that there are very good prospects for a cotton industry in the Soudan; but that it has not been developed for lack of means of transport. Schemes are on foot for the removal of this difficulty; these consist of the actual construction of a short line from Khartoum toward El Obeid, and the proposed making of a railway between Khartoum and Massowah. Both of these will open up a very fertile country.

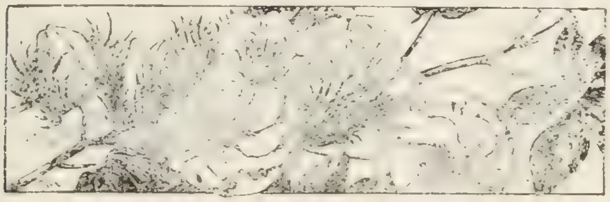
A Committee, called the Jamaica Standing Committee, has just been formed for the purpose of reporting to the West India Committee on Jamaican affairs. It includes Mr. E. A. de Pass (Chairman), Mr. C. A. Campbell, Mr. C. Gurney, Mr. H. Crum Ewing, Mr. W. Fawcett, Mr. William Gillespie, Mr. N. Malcolmson, Mr. G. Moody-Stuart, Mr. H. A Trotter, and Mr. Algernon E. Aspinall (Secretary), with power to add to its number.

At a meeting of the Dominica Agricultural and Commercial Society, held on December 30, 1909, it was resolved that, in all documents issued in future by the Society, the fruit of the lime tree be termed Limes; the oil made by distillation be termed Essential Oil of Limes; the oil made by the écuelle process be termed Otto of Limes; and further that the Society use every effort to get this improved nomenclature generally adopted.

The *India-Rubber World* gives information concerning *Euphorbia lactiflua*, a rubber shrub discovered by the botanical section of the Chili National Museum. It is stated that the claim is made that a very good quality of rubber can be obtained from the shrub. The plant is much scattered, and difficult of access in many places, but it is said that it could easily be cultivated, and a company has been formed or the purpose of exploiting it.

In the Monthly Bulletin of the French Chamber of Commerce at Rio de Janeiro, it is stated that a large industry exists in Paraguay, for the production of essence of 'petit grain' from the oil yielded by bitter orange leaves, by distillation. It is simply and cheaply produced in a number of small factories, the output being in the proportion of 1 lb. of the essence from 300 lb. of orange leaves. The essence, which obtains a price of 11*s.* to 12*s.* 6*d.* per lb. at Asuncion, is used as a basis for a large number of perfumes.

An Ordinance has recently been passed in St. Vincent, entitled: An Ordinance to further regulate the purchase of Cotton and to amend 'The Agricultural Products Protection Ordinance 1906'. It provides for the appointment of inspectors of cotton; the examination of cotton land by these; the regulation of sales of quantities of cotton not exceeding 1,000 lb.; the making of rules for regulating the purchase of cotton by the Government Ginnery; the rendering of annual returns of areas planted in cotton to the Treasurer; and for penalties for offences against the Ordinance.



STUDENTS' CORNER.

MARCH.

First Period.

Seasonal Notes.

Where several varieties of sugar-cane have been planted, a useful opportunity will have been afforded, by this time, of observing their relative value as regards the production of plants from cuttings. Make observations of the more obvious characters of each kind, with the object of discovering if the variation in the power to form new plants has any relation to differences that are to be seen in those characters. Discuss the relation that the power quickly to form good, healthy plants bears to the ability to survive drought. Where it is possible, make observations and drawings, for the purpose of gaining an accurate idea of the ways in which growth takes place after the canes have been cut from a stool that is left to form ratoons. Reference to the *West Indian Bulletin*, Vol. X, No. 2, pp. 117-21, will be of assistance in gaining information in regard to this matter.

Note the way in which Bordeaux mixture is made. How may it be easily ascertained whether a sample of this mixture has been properly made or not? Is there any danger in using badly prepared Bordeaux mixture for disinfecting sugar-cane cuttings? If so, why? Consider whether an improvement on the methods in vogue for treating cuttings with this mixture could be devised, such as in the construction of wire baskets which would facilitate the wetting and removal of the cuttings. (See *Agricultural News*, Vol. VIII, p. 315.) Have any other methods been employed for the treatment of cane cuttings before planting? Describe any that you know of, and compare their efficiency, in the matter of disinfection, with that of the use of Bordeaux mixture. (See *West Indian Bulletin*, Vol. V, p. 99, VI, p. 48.)

What is the essential difference between a cane cutting and a cane 'top'? Why is the latter generally used as a food for stock instead of being ground in the mill? Cut through a piece of sugar-cane, in the direction of its length, so as to include one or two of the nodes. What is the appearance of the vascular bundles, and why are these structures called by that name? In what part of the cane does the juice containing the sugar exist chiefly? Carefully trace the course of the vascular bundles and ascertain what becomes of them when they reach a node. In what part of the cane are new bundles formed? Why is it that the sugar-cane is harder in the outer than in the inner part? Compare the cane, in this respect, with the stem of a dicotyledon.

In regard to cotton, make observations in connexion with the effect of the time of planting on the severity of the attacks of the flower-bud maggot, and compare the date of the appearance of this pest during the present season with that of former ones. Make a careful review of the causes that may be effectual in bringing it about that the insect is much more prevalent in some seasons than in others. What is the definite circumstance in its life-history that causes it to lessen the yield from the cotton plant? What other plant or plants does it infest, and how may it be found in them? Where does the insect pass its pupal stage?

In places where cotton has been planted as a catch crop with cane, it will now have been turned in. Where it is being employed as a stage in a rotation, and where a second picking is being obtained, a careful watch for leaf-blister mite must be kept, and all affected leaves should be picked off and burnt, preferably as near as possible to the place where they have grown. Why is it unwise to carry material infested with leaf-blister mite any greater distance than is necessary, even if bags are used for the purpose? To what kinds of animals is the leaf-blister mite most nearly related? (See *Agricultural News*, Vol. VIII, p. 346.)

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by humus? How is it beneficial to crops?

(2) Name the special arrangements that may be required in growing a plant possessing tendrils. What parts of a plant may be changed in such a way as to enable them to perform the function of tendrils?

(3) Describe a suitable agricultural rotation where the staple crop is cotton.

INTERMEDIATE QUESTIONS.

(1) Describe the symptoms that are shown by a cane suffering from rind fungus.

(2) Give an account of the chief characters of a good sample of molasses.

(3) Draw a map of the island in which you live, showing the position of the different kinds of soil that exist there.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the SS. 'Balantia', on February 22, 1910, for the purpose of accompanying the members of the Royal Commission appointed to enquire into trade relations between Canada and the West Indies. Dr. Watts returned to Barbados on the 28th ultimo.

Mr. V. M. Weil, B.Sc. (Lond.), has been appointed, by the Secretary of State for the Colonies, Assistant to the Government Analyst and Agricultural Chemist for the Leeward Islands, in connexion with the Imperial Department of Agriculture for the West Indies.

Mr. Weil arrived in Barbados, on his way to Antigua, by the SS. 'Oruba', on the 1st instant.

Mr. W. R. Dunlop has been appointed, by the Secretary of State for the Colonies, to the post of Agricultural and Science Master at the St. Kitts Grammar School, in connexion with the Imperial Department of Agriculture.

Mr. Dunlop arrived in St. Kitts, to take up the duties of his appointment, on February 19, 1910.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part I.

The following series of articles is intended to give a short account of the chief groups of fungi, and of the characters (both those as seen by the naked eye and those as viewed under the microscope) by means of which they are separated from one another. Any points of interest that occur in the life-cycle of members of the different groups will also be described. The series should be read in conjunction with the three articles on fungi published in the *Agricultural News*, Vol. VIII. pp. 251, 267 and 283. It is hoped that they will be of general interest and also of assistance to those taking the Courses of Reading, as helping to throw light on the true nature of a fungus, on the different forms under which these plants may appear, and on the various types of injury they may inflict upon the higher plants. The groups will be taken in the order of the relative complexity of their reproductive arrangements; the simplest forms being treated first and the more complex ones later, particularly as this is considered to be the order of their evolutionary development. They will be dealt with broadly, and no reference will be made to the characters separating families, genera, or species, as this would prevent the subject from being treated in a sufficiently simple manner. Typical fungi illustrating the characters of any group will be selected as far as possible from those well known in the West Indies, either as causing diseases of crops with which many are acquainted, or as being of some economic usefulness to the planter, for example, the fungus parasites of insects.

Before turning to the fungi themselves, it may be of assistance if some idea is given of what is understood by the words species, genera, natural order and cohort.

The starting point for all systems of classification of any description of objects is always the individual. Thus, among plants, the first thing noticed is always a collection of individuals, each of which differs from the other to a greater or less extent. On further careful examination, it becomes clear that some of these plants resemble each other more than any other of the plants examined. Such a group of plants is known as a Species. It now becomes necessary to consider on what ground this resemblance is based. On looking at one plant, it may become clear that it is somewhat similar to individuals of another kind, in the way that the Hibiscus resembles the cotton plant. The question is: In what ways is this similar to the cotton plant? Careful examination shows that, though the flowers are of a different colour, yet each has the same number of petals, and the other parts of the flower are alike in each, and of the same number in each. Further, both plants are of a bushy habit, although the leaves are different. Thus on the sum of various characters exhibited by each, there are more points of resemblance than of difference, and consequently the plants may be said to be related to one another fairly closely. The resemblance is somewhat similar to that often shown between the different members of the same family in the human race. The idea underlying a natural system of classification is to bring together into the same species those plants which are related in the same way as the various members of a human family are related, all of whom had the same ancestors. In speaking of human relationships, it is often said that the members of a certain family have one, or possibly two, features that are characteristic, as for example the eyes, the mouth, or even the voice. In considering plants, it is often found that two plants whose general appearance is very different have flowers and fruits that are very similar.

As in observing the relationships of human beings, greater importance is often attached to similarity of eyes and voices or any two similar features than to the numerous dissimilarities, so in the case of plants greater importance is often attached to similarities in the flowers and fruit than to dissimilarities of general habit. With plants, this may be done without involving much danger of classing together those which are not really related, for a reason that may be given as follows. The flowers and fruit of a plant are its reproductive organs, and consequently are not engaged in obtaining food for the plant. Now, while the conditions of temperature, moisture, food supply and so on, under which a plant lives, may have a very considerable effect on those parts that are concerned with obtaining its food, they will not have so immediate an effect on its reproductive organs.

Consequently, plants which are fairly closely related may show very considerable differences in their vegetative parts, that is in the parts engaged in obtaining their food, while they still exhibit a very close resemblance in their reproductive parts. As a result of this, the classification of all plants rests mainly on the characters of those organs by which they reproduce themselves.

To return to the definition of species, it is now evident that a group of plants which resemble one another more closely in the sum of their characters, more especially those of their reproductive organs, more than any one of them resembles any other plant in these characters, may be said to form a species.

Similarly, any group of species, each of which resembles the others more closely than it does any other species, forms a Genus; and similar groups of genera form a Natural Order or Family. Groups of similar families form Cohorts, which are the main subdivisions of the great primary divisions of the plant kingdom.

In the case of the fungi, just as has been shown for flowering plants, the characters of the reproductive organs are those on which the classification is most especially based, as in many cases the mycelia, or vegetative parts, even of widely different groups, are so similar as to be almost indistinguishable.

Broadly speaking, there are two different types of reproduction in the fungi. In the first, a special portion of the plant body is prepared and separated off for the purpose of increasing the numbers of the plant. Such a portion is known as a conidium, or spore, and is capable of germinating again very quickly, if it is placed under conditions suitable to the growth of the fungus, such as a sufficient and acceptable food supply, plenty of moisture and a suitable temperature. Such spores are merely parts of the plants from which they were cut off, and the plants that grow from them resemble the parent in all respects. As has been pointed out before, these spores are produced in immense quantities when all the external conditions are suitable to the fungus, and are those to which an epidemic of any disease is due. Fungi belonging to very different species, or even genera, may produce spores of this kind, which are very similar in appearance, consequently such spores are mainly of secondary importance in classification.

Nearly all the groups of fungi also produce another type of spore; this is usually formed by means of a sexual process, and is especially adapted for tiding over unfavourable circumstances; that is, its main purpose is to ensure the continuation of the species in time. With this end in view, it is usually supplied with a thick outer skin, often covered with ridges or spines, and with a reserve supply of food in the form of starch, sugar, or, more frequently, oil. As the fungi (like other plants) have developed during the course of ages, the special apparatus for the production and protection of these spores has become more and more complex, partly, no doubt, owing to the many changes in external conditions to which they have been subjected; at the same time, the sexual process by which the spores were formed has become simplified, and in some instances, appears to have died out altogether. Nevertheless, the characters of these spores, and the complexity of the organs formed for their production and protection when young, are the principal characters upon which the fungi are classified. For whereas the asexual spores are more generally borne on exposed portions of the mycelium, without any protection, the sexual spores in the higher groups are always borne on, or in, some special form of organ which protects them when young. The full meaning of this will, it is hoped, become clearer in the light of the articles which are to follow.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of January :—

The beginning of the new year, like the close of the old one, always brings with it a disruption of business in the produce markets generally, and the commencement of the present year has been no exception to the rule, but, on the contrary, besides the ordinary extension of the holidays into the first week in January, and the annual stock-taking operations, the Parliamentary elections have absorbed a good part of the month, with the inevitable result of the disorganization of business generally. Notwithstanding all this, there has been a steady under-current of increasing trade, which it is hoped may be maintained. The only products that have received special attention during the month are glycerine and Buchu, the former of which is advancing by leaps and bounds, and the latter, not only being very scarce, but having risen steadily in price from $7\frac{1}{2}d.$ to $10d.$ per ℔. early in the past year, and $1s. 6d.$ to $2s.$ at its close. Nothing, however, has occurred of any special note in connexion with West Indian products, as the following details will show:—

GINGER.

At the first spice sale on the 5th there were no offerings of Jamaica, but about 500 packages of Cochin and Calicut, partly comprised of unsorted native cut, were brought forward and bought in at 53*s.* to 55*s.* per cwt. Washed rough Cochin and rough brown Calicut were also offered and bought in, the first at 43*s.* and the second at 42*s.* Some 200 bags of fair limed Japanese were sold without reserve, at 38*s.* 6*d.* per cwt. In the following week no ginger of any kind was brought forward, but on the 25th, 44*s.* per cwt. was paid for 300 bags of washed Cochin, while rough Calicut fetched 48*s.*, and native cut 56*s.* 6*d.* Japanese realized 40*s.*

NUTMEGS, MACE AND PIMENTO.

At the first auction, West Indian nutmegs, to the extent of 428 packages, were offered, about 400 of which, of inferior quality, were disposed of at a decline of 1*s.* 4*d.* to 1*s.* 2*d.* per ℔. on previous rates. The supply of good sound nuts was stated to be small. At the same sale 53 packages of West Indian mace realized from 1*s.* 7*d.* to 1*s.* 9*d.* per ℔. for fair palish to pale, fair to good reddish fetching 1*s.* 6*d.* to 1*s.* 7*d.*, and broken 1*s.* 3*d.* to 1*s.* 4*d.* On the 25th the demand was very limited with lower prices, namely West Indian red 1*s.* 7*d.*, and broken 1*s.* 2*d.* to 1*s.* 3*d.* In pimento there has been very little doing during the month. At the auction on the 12th, 83 bags were offered and the whole of it bought in at $2\frac{1}{2}d.$ per ℔. Again, on the 25th, the whole of the offerings, amounting to 44 bags, were bought in at the previous rates.

SARSAPARILLA.

At the first drug auction on the 13th, sarsaparilla was in good supply, the offerings amounting to 45 bales of grey Jamaica, 15 bales of native Jamaica, 62 bales of Guatemala, 13 bales of Honduras, and 8 of Mexican. The whole of the grey Jamaica were sold at the following rates: good fibrous 1*s.* 2*d.*, fair 1*s.* 1*d.*, common rough 1*s.* Five bales of native Jamaica sold at 11*d.* per ℔. for fair red, while 8 other bales were bought in at 1*s.* Common chumpy Mexican was bought in at 4*d.* to $4\frac{1}{2}d.$ per ℔., while another lot of Mexican in rolls, and freed from chumps, fetched $7\frac{1}{4}d.$

CANELLA ALBA, CASSIA FISTULA, LIME JUICE, TAMARINDS, ETC.

Of Canella bark, it is stated that good quality continues scarce, but that prices vary from 59*s.* to 60*s.* per cwt. Some 55 packages of Cassia Fistula arrived from Hamburg at the end of the month, but not in time to be included in this month's report. Concentrated West Indian lime juice was reported, at the beginning of the month, as firm at £18 5*s.* At the same period some small sales of Antigua tamarinds were made at 12*s.* 6*d.* per cwt., and for Barbados 16*s.* was the price asked. In the middle of the month, fair West Indian kola realized $2\frac{1}{2}d.$ to 3*d.* per ℔. for 11 bags, and for 3 bags of fair bright halves $2\frac{1}{2}d.$ per ℔. was paid, and $1\frac{1}{2}d.$ per ℔. for small dark and part mouldy.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated February 18, 1910, gives information as follows :—

Since our last advices, dated 4th inst, the weather has continued unfavourable to milling operations, and deliveries to town have been delayed.

Exports have been large (4,695 bags) but prices are only moderately firm; stocks of paddy are considerably reduced, and once the growers have disposed of surplus stock, higher prices must ensue.

In the meantime, quotations are as last advised, with a firm tone.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally 16*s.* 9*d.* to 17*s.* 9*d.* per bag of 180 ℔. gross.
15*s.* 9*d.* to 16*s.* 9*d.* „ „ „ 164 ℔. „

MARKET REPORTS.

London,—The West India Committee Circular, February 15, 1910; Messrs. E. A. de Pass & Co., February 4, 1910.

Arrowroot—1¾d. to 3¾d.
Balata—Sheet, 2/7; block, 2/1½ per lb.
Bees-wax £7.
Cacao—Trinidad, 52/6 to 62/- per cwt.; Grenada, 48/- to 53/6 per cwt.; Jamaica, 47/- to 52/-.
Coffee—Jamaica, 39/- to 59/-.
Copra—West Indian, £25 10s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; St. Croix West Indian, 18½d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 49/- to 52/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 10d. to 1/-; concentrated, £18; Otto of limes, 5/9 to 6/-.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—Steady.
Pimento—Common, 2¼d.; fair, $2\frac{5}{16}$d.; good, 2⅜d. per lb.
Rubber—Para, fine hard, 8/2½, fine soft, 7/10½; fine Peru, 8/1 per lb.
Rum—Jamaica, 2/4 to 5/-.
Sugar—Crystals, 16/3 to 18/9; Muscovado, 13/3 to 15/3 Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., February 4, 1910.

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11½c. to 11¾c.; Trinidad, 11½c. to 12c.; Jamaica, 9¾c. to 10½c. per lb.
Cocoa-nuts—Jamaica, select, \$27·00 to \$28·00; culls, \$17·00 to \$18·00; Trinidad, select, \$25·00 to \$26·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, ordinary, 8¾c. to 9c.; good ordinary, 9¼c. to 9½c.; and washed, up to 11½c. per lb.
Ginger—9¼c. to 10¼c. per lb.
Goat Skins—Jamaica, no quotations; Barbados, 55c. to 57c.; St. Thomas, St. Croix, St Kitts, 51c. to 53c. per lb.; Antigua, 55c. to 57c., dry flint.
Grape Fruit—\$1·50 to \$2·25 per box.
Limes—\$4·00 to \$5·00 per barrel.
Mace—34c. to 37c. per lb.
Nutmegs—110's, 10c. per lb.
Oranges—Jamaica, no quotations.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·17½c. per lb.; Muscovados, 89°, 3·67½c.; Molasses, 89°, 3·42½c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., February 19, 1910.

Cacao—Venezuelan, \$12·65 per fanega; Trinidad, \$11·50 to \$12·00.
Cocoa-nut Oil—96c. per Imperial gallon.
Coffee—Venezuelan, 10¾c. per lb.
Copra—\$4·75 per 100 lb.
Dhal—\$4·20 to \$4·30 per 2-bushel bag.
Onions—\$3·75 per 100 lb.
Peas, Split—\$6·75 to \$7·00 per bag.
Potatos—English, \$1·20 to \$1·60 per 100 lb.
Rice—Yellow, \$5·00 to \$5·10; White, \$5·00 to \$5·10 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., February 28, 1910; Messrs. T. S. Garraway & Co., February 28, 1910.

Arrowroot—St. Vincent, \$3·60 to \$3·75 per 100 lb.
Cacao—\$10·00 to \$10·50 per 100 lb.
Cocoa-nuts—\$14·00.
Coffee—Jamaica and ordinary Rio, \$10·00 to \$11·00 per 100 lb., scarce.
Hay—\$1·20 per 100 lb., dull.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$48·00; Sulphate of ammonia, \$75·00 per ton.
Molasses—No quotations.
Onions—Bunched, \$3·50 per 100 lb.
Peas, Split—\$6·20 to \$6·25 per bag of 210 lb.; Canada, \$3·50 per bag of 120 lb.
Potatos—Nova Scotia, \$1·80 to \$2·00 per 160 lb.
Rice—Ballam, \$4·33 to \$4·50 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, February 19, 1910; Messrs. Sandbach, Parker & Co., February 18, 1910.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$8·00 to \$8·25 per 200 lb.	\$8·00 to \$8·25 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
Cacao—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
Cassava—	\$1·08	No quotation
Cassava Starch—	\$6·00 per barrel of 196 lb.	No quotation
Cocoa-nuts—	\$12 to \$16 per M.	\$16 per M., peeled and selected
Coffee—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14c. to 14½c. per lb.	14c. to 14½c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	\$4·40 to \$4·50 per bag of 168 lb.	\$4·50 to \$4·65 per bag of 168 lb.
Green Dhal	none	——
Eddos—	\$2·16 per barrel	——
Molasses—Yellow	none	——
Onions—Teneriffe	——	No quotation
Madeira		No quotation
Peas—Split	\$6·45 to \$6·50 per bag (210 lb.)	\$6·50 per bag (210 lb.)
Marseilles	\$3·50	\$3·50 to \$4·25
Plantains—	20c. to 60c. per bunch	——
Potatos—Nova Scotia	\$2·75	\$2·75
Lisbon	No quotation	No quotation
Potatos-Sweet, Barbados	\$1·32 per bag	——
Rice—Ballam	No quotation	\$4·75
Creole	\$4·00 to \$4·20	\$3·80 to \$4·00
Tannias—	\$1·92 per bag	——
Yams—White	\$2·16	——
Buck	\$2·16 per bag	——
Sugar—Dark crystals	\$2·65 to \$2·85	\$2·60
Yellow	\$3·00 to \$3·25	\$2·80 to \$3·00
White	\$3·75 to \$3·80	\$3·60 to \$3·80
Molasses	\$2·00 to \$2·25	\$2·00 to \$2·30
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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The 'AGRICULTURAL NEWS'. A Fortnightly Review.

The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

The 'Agricultural News' is printed in time to be distributed, regularly, by each mail, and is on sale by the local agents of the Department at one penny per number, post free, 2*d.* The subscription price, including postage, is 2*s.* 2*d.* per half-year, or 4*s.* 4*d.* per annum. Volumes IV, V, VI, and VII complete, with title page and index, as issued —Price 4*s.* each.—Post free, 5*s.* Some numbers of the early volumes are out of print and therefore these volumes can no longer be supplied complete. The scale of charges for Advertisements may be obtained on application to the Agents *All applications for copies are to be addressed to the Agents, not to the Department.*

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OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Problem of Agricultural Education.

II. THE MEANS OF EDUCATION.

IN the last article on this subject the chief attention was given to the more advanced stage of agricultural education. In the present one, its elementary, or primary, stage will be dealt with more particularly. The importance of this does not only arise from the fact that it is concerned naturally with a larger number of those who are in receipt of education, but from the circumstance that its methods should indicate, generally, the plan according to which the more advanced work should be conducted. This plan is continuous throughout all the stages, and consists, broadly, in the circumstance that the mind should receive training with the aid of the exhibition of facts in a concrete, rather than an abstract, form.

It is evident that the pupil leaving the elementary school differs most largely from all others in the fact that he ceases to be the recipient of information given in an organized manner at an early age. Thus, only a comparatively short time is at the disposal of his teachers for the purpose of giving him the mental training which will best fit him to fill the position to be occupied by him ultimately. The very shortness of this time makes it all the more important that the greatest care shall be exercised in the matter of educating him according to the most efficient methods. This does not mean that any attempt should be made in the direction of equipping him as fully as possible with a knowledge of some technical subject. An endeavour will be made to present the correct interpretation by means of the following considerations.

A clear view of the position is given in a statement by one who could speak with authority concerning the professional side of education—the late Bishop Creighton: 'If a boy is going to be educated till eighteen, it does not matter that his knowledge should be in a very confused state at fourteen. But if his education ends at thirteen or fourteen it is necessary that he should understand *then* why and what he was taught.' It is to be noticed that, in this statement, importance is not given to the fact of being taught or to the kind

of teaching, but to that of *understanding* the matters that the educational system brings forward. The work of the educationalist is to find the best means to bring about this state of understanding.

In July of last year, a Conference on Rural Education was held in England. At this, teachers and those who have the planning of methods of education in their hands met together for the purpose of finding the way in which the education of pupils in elementary schools could be brought into line with their needs when they leave such schools. It was agreed that the ordinary curriculum which takes such pupils through their course does not fit them sufficiently for the work in which they are engaged afterwards; in short, that they leave school without understanding why or what they have been taught. Those who were present at the conference sought from their own experience a means to modify or enlarge the system so that it may become more adequate to do this, and it is a notable fact that the teachers unanimously testified to the value of manual work as a method of education.

If such a form of education is to meet successfully the demands that will be placed upon it, two important requirements must be filled by it. These have their effect, respectively, during school life and in the work that the pupil must take up afterwards. In the first connexion it must possess the criterion of giving the understanding of which mention has just been made. In the second, it must effect something toward fitting the pupil for the service which will be demanded from him in order that he may make a living. The search for the best means of education can be made, then, in the light of these two criteria.

The experience of teachers tends further, every day, to show that subjects, as for instance arithmetic, can be more easily understood by children if they are taught by means of actual, every-day measurements than if the attempt is made to impart ideas of such subjects merely with the aid of abstract quantities. The setting of the meaningless 'sum' in which there is little concrete aid to the imagination merely leads to the learning of a 'rule'. Even when this rule has been 'learnt', nothing has been done to impart that elasticity of mind to the pupil which will enable him to appreciate an example for the working of which it ay have to be varied in an intelligent manner. What is worse, it is more than possible that he will leave school devoid of the ability to make use of it in the very instances when it is required by him to give assistance. This suggests that his work in school should be arranged as nearly as possible to give a picture of what his working life will be when he leaves it. It is thus seen that the attempt to find a way in which to arrange the work in school to the best educational purpose has led naturally to the discovery of a means of making that work of a kind which will be the most useful when the scholastic education has come to an end.

It has been pointed out already that education in the West Indies, in any stage, must have an agricultural trend if it is to fulfil its purpose in the best manner. It is therefore requisite to find out how this may be given to it. For some time, now, the school garden has been recognized as a valuable means for the purpose. There has also been recognition of the fact that it must not be used merely to teach agriculture. There must be a much wider appreciation of its possibilities for assisting in the education of the pupil, if it is intended to do its work properly. Every opportunity should be employed for the purpose of intimately connecting the work of the school garden with that of the ordinary subjects of the curriculum. As many of these subjects as possible should begin in the garden, and be followed up with all the aid that can be obtained from it.

An illustration has been given already of the way in which nature study, with the aid of the school garden, can assist the teacher. Many others might be presented. Under the old system, the teaching of composition required great pains on the part of the teacher, and yet, few left school with anything like an adequate knowledge of it. Now, the pupil willingly writes up his gardening note book, because he is dealing with something that affects him personally; at the same time, he gains a lasting power to write clearly and strongly. The old reading lesson, with its uninteresting subjects, listlessness and inattention, has given place to one in which the pupil reads, and asks questions, about things that are actually before him, and which come into intimate relationship with his daily life. This is why, in many cases, he is found reading books and journals whose purpose is to assist him to get the best out of his work. He is beginning to undertand why and what he is taught.

Such considerations enable it to be seen that, in all stages, the kind of education required is the one which leads out to the matters of daily life. The means for the provision of this are supplied by the concrete example and by the mental experience that is derived from the exercise of the powers of observation.

SUGAR INDUSTRY.

THE SUGAR INDUSTRY OF MAURITIUS.

The following extracts are taken from an interesting article on the sugar industry of Mauritius, which has appeared recently in the *International Sugar Journal*:—

HISTORY. Of recent times the sugar industry of Mauritius has undergone many ups and downs of fortune; it has passed through years of great stress, the causes of which have been various, viz: keen competition of bounty fed beet sugar in the Indian markets, with the attendant low prices, cattle plagues, droughts and cyclones, which brought the industry at times to the verge of ruin.

These hard times mentioned above have led to many estates, or rather factories, being closed. The small factories as a rule were costly to work; the yield of sugar per ton of cane was low, owing to poor milling power and antiquated methods of manufacture. The cane from these estates, when the mills had been closed, was sent to other factories to be milled at either a fixed price per ton of cane delivered on the balances, or in exchange for so many pounds of sugar agreed upon between the parties. The system of payment, dependent on the quality of the cane, is in force in a few instances where the quantity of cane delivered is large. All the balances for canes are checked by Government officials at frequent intervals.

In many ways, the closing of small and inefficient factories benefited the industry in general: the larger and better situated factories were able to increase their tonnage of cane milled, work longer hours, improve their machinery, with an assured supply of cane, and at the same time reduce their operating expenses per ton of sugar made: thus their efficiency was improved all round.

In the face of the adverse circumstances mentioned at the beginning of this article, all the remaining factories were forced to improve their machinery and reduce their working expenses, if they wished to continue to live in the struggle for existence that was going on.

FACTORIES. The larger factories are in charge of their own chemists, and others, of a chemist who pays two or three visits a week, but it is desirable that every usine should have its own resident chemist, as continuous supervision is very necessary. It may be here mentioned that all steam boilers in or about a factory, as well as those of locomotives and traction engines, have to be periodically examined by inspectors appointed by the Colonial Government.

The whole of the bagasse from the mills is burnt in the green state, in step grate furnaces under various types of cylindrical and water tube boilers. The majority of factories burn considerable quantities of filao wood (*Casuarina equisetifolia*), and blue gum (*Eucalyptus globulus*), all grown in the country.

CARRIAGE OF CANE. Up to the present, no mechanical unloading devices have been installed at the cane carriers, all canes being unloaded from the wagons by hand. There would be considerable difficulties to be overcome if they were introduced, owing to the present diversity of the means of supply, cane being delivered by Government railway, traction engines, and tramway wagons and carts.

In the year 1902, in addition to a poor crop, caused by the damage done by two severe cyclones in the month of February (resulting in a reduction of over 30 per cent. of cane available), trypanosomiasis, a formidable cattle disease locally called 'surra', broke out about the middle of the year, just at the beginning of crop time, and threatened to swamp the whole industry. It was only with great difficulty and much exertion that the crop was carried, men being employed to haul the carts, while the cane in a few inaccessible fields on some estates was left standing. The whole stock of draft animals became infected and died off very rapidly, and by the end of the year 1902, the island was practically denuded of all animal transport, very little mechanical transport being then in operation in the island, and the disease carrying off mules, horses and oxen indiscriminately. Application was again made to the Colonial Government for assistance, and after some delay, a loan called the 'Mechanical Transport Loan' was granted. On the completion of the necessary preliminaries, such as rate of interest, terms of repayment and security offered, etc., orders were immediately placed in Europe for the supply of tramways, locomotives, traction engines, etc., and the work of preparation by the estates for the new means of transport was energetically pushed forward, pending the receipt of the material ordered. Before everything had arrived and been put in working order, the crop had begun, but soon everything was working well and the cane successfully harvested.

CLIMATE. The climate is an excellent one for cane-growing. The island is situated in Lat. 19° 58 South, Long. 57° East. There are no great variations in temperature throughout the year, the average is 75°F. The rainfall is good, the average for the last twenty-five years for the whole island works out at 75 inches, but estates on the windward side of the island, south-east and east, receive considerably above that figure, especially those some distance from the seaboard. The greater part of the total falls from December to April. Rather more than two-thirds of the total quantity falls in those months. Unfortunately, the island is liable to be visited by severe cyclones during the season December to March, inclusive, which sometimes do enormous damage in breaking down the cane and wrecking buildings. There is an admirable system of warnings issued by the observatory, and posted up at the railway stations, when a cyclone is approaching, so that the inhabitants have time to make their preparations.

SOIL. The soil varies considerably in different districts of the island. In some it is free, open, and of good depth, without rocks or large boulders, and suitable for the plough. Ploughs were once used, but have been discarded, the now universal hoe having taken their place. In other districts the land is full of rocks and stones, and of shallow depth, necessitating a good deal of crowbar work when preparing it for planting.

The extinction of all the draft animals has had a very serious effect in the increased quantity and cost of artificial fertilizers that have to be used. All the sewage and refuse from the villages is sent to the manure works of the estates, and used in the fields, as well as a considerable quantity of molasses.

CULTIVATION. The usual practice is to cut the cane three times—plants, first and second ratoons. The planting is almost entirely tops—few cuttings are put in. The tops are selected with great care from the most vigorous varieties, the Big Tanna, black, white, and striped, being the principal kind, and giving the best results, but various other sorts are used. The tops are carefully examined for signs of disease, washed in lime water, and then planted in holes about 15 inches × 8 inches × 6 inches to 9 inches deep, about a foot apart in rows, 3 feet to 4 feet centres, the practice varying slightly on different estates.

Irrigation is in use in few cases, but not on a very extensive scale.

WEST INDIAN FRUIT.

THE STATE OF THE NUTMEG INDUSTRY.

The Imperial Department of Agriculture has recently received enquiries as to the prospects of disposing of the essential and expressed oils of nutmeg at remunerative rates. In response to these, information has been obtained which is of more general value, and the bulk of it is therefore published here.

Firstly, as regards the demand for West Indian nutmegs in the United States of America, the position is summarized in the following article which appeared in the *Spice Mill* for November 1908, p. 677 :—

Although the ordinary consumer in this country [U.S.A.] never heard of, or purchased, British West Indies nutmegs under their name, still those articles are being sold to them, mixed up with Singapore nutmegs. Owing to the small demand in the United States for the British West Indies nutmegs, because of their inferior quality, the importations are exceedingly light, amounting to about 2,000 barrels per annum. The nutmegs are shipped principally from Grenada (which island is the heaviest producer of the entire group of the British West Indies) to London, England. There they are graded as to size, and mixed with Singapore nutmegs, and then shipped to this market and sold under the trade name of Singapore nutmegs. The import market value of British West Indies nutmegs is from 10 to 20 per cent. below the import price of Singapore nutmegs, according to size and quality.

The total production of nutmegs in the British West Indies is so small that it is not taken into consideration in the preparation of statistics here or abroad. Not until the quality of British West Indies nutmegs is improved by cultivation can they be sold under their real name.

Attention is also drawn to a translation of an article bearing on the subject generally, from *De Indische Mercuur*, which appears in the next number of the *Spice Mill* (December 1908, pp. 749-50). The chief conclusions, due to Dr. Treub, Director of the Botanic Gardens, Buitenzorg, Java, reached in this, are :—

(1) That the price obtained for nutmegs has been declining, with large fluctuations, for many years. This is shown in the following table, which gives the prices, per ½-kilo, obtained in Amsterdam for 110's to 115's, in cents, for Banda nutmegs, since 1898 :—

	Highest.	Lowest.	Average.
1898	95	80	86
1899	84	78	81
1900	80	80	80
1901	65	57	60
1902	78	55	64
1903	86	76	81
1904	63	50	55
1905	50	43	46
1906	55	43	48
1907	43	36	39

(2) It is difficult to trace the real cause of the lower prices. It is not entirely due to overproduction, as is shown by the following table, giving the total export (from official statistics) during the same years, from the Dutch East Indies, which are the principal producers of the article :—

	Kilos.
1898-9	1,889,772
1899-1900	2,670,431
1900-1	2,861,518
1901-2	2,391,072
1902-3	2,840,304
1903-4	2,686,399
1904-5	3,389,804
1905-6	2,793,090

(3) It is suggested that the fall in value of the product is due to a smaller demand, consequent on a decreased consumption *per capita*.

(4) In considering any possible effects of increased production, the exports from Java cannot have had much influence on the result. This is shown by the table below, compiled from the statistics of the Handelsvereeniging (Commercial Society) of Batavia, Java, which shows the share of that island in the total export from the Dutch East Indies. It should be compared with the table that has just been given :—

	Kilos.
1902	99,000
1903	82,375
1904	199,200
1905	174,200
1906	182,200
1907	147,500

(5) As far as nutmeg tallow (or nutmeg soap) is concerned, it appears that this is only used in the drug trade and, to a certain extent, in the manufacture of perfumery. It is not likely that the fall in price of this, in harmony with that of nutmegs, would lead to such an increased demand as to

react in the direction of raising the market value of the nutmegs.

(6) The field for nutmegs as a spice is much larger than that as a material for the oil. Even if the nutmeg tallow (obtained from the oil) could be used on a larger scale, for manufacturing soap, the price paid would be too low to make it profitable to grow nutmegs.

(7) In view of the fact that the demand for nutmegs is not greater, and that there does not seem to be any prospect of its increase, Dr. Treub recommends that growers in Java should not enlarge the area under cultivation, but that they should replace the plant by another crop, as soon as possible.

In their Semi-Annual Report, dated October 1909, Messrs. Schimmel & Co. say:—

Nutmeg oil remains unchanged at low prices. There has been no lack of cheap nutmegs suitable for distilling, and occasionally exquisite material could be found at ridiculously low prices. All those interested in the article are advised, when requiring large parcels, to ask us for special quotations.

To return to the nutmeg itself, an account is given, in the *Revue des Cultures Coloniales*, Vol. XIV, pp. 343-4, of the way in which it is prepared for export at Djati Roengge, Java, from which the following is translated:—

The preparation of the crop for export is very simple. The mace is carefully removed from the 'seed', in order to prevent the growth of moulds, and then the latter is washed in brine. Drying is conducted in sunshine, or by means of a drier, as quickly as possible. The nuts, separated from the shell, are rolled in slaked lime and then packed in cases, the interior of which is coated with lime: these cases measure 45 × 45 × 45 centimetres (1 foot 6 inches each way), and are each capable of holding 60 kilogrammes (about 132 ℔.) of nutmegs. The mace is packed in unlimed cases, which are lined with paper. These measure 61 × 61 × 61 centimttres (about 2 feet 0½ inch each way), and each also holds about 60 kilogrammes. These measurements are the ones preferred by the importers at Amsterdam. The cases are strengthened by means of iron bands or iron wire. The treatment of the nuts with lime is for the purpose of preserving them from a boring beetle called 'boeback'. At Banda, they are sometimes smoked for the same purpose, though this does not appear to be necessary. The natmegs are graded into nine kinds, and the mace into four kinds.

In dealing with the question as to the advisability of expressing the oil (fat) from the nuts for shipment, careful experiments are required for the purpose of ascertaining what proportion of the oil can be extracted. To approach the question theoretically, on consulting various authorities, it was found that the average proportion of oil that can be expressed from the powdered nuts, with the aid of heat, is about 25 per cent. of the weight of the material pressed. A barrel of nutmegs weighs approximately 165 ℔., so that this quantity would yield about 41 ℔. of oil. As far as the essential oil is concerned, according to Gildemeister and Hoffmann's *Volatile Oils*, the amount of oil obtained by distilling nutmegs varies from 8 to 15 per cent. of the weight of the material taken. Allowing a simple average of 10 per cent., this would give 16½ ℔. of essential oil from 1 barrel of nuts.

In considering, however, the advisability of placing the oils on the market, the chief matter of serious import is that, as is shown above, there is only a very limited demand for either of them.

THE IMPORTANCE OF BROAD BREEDING IN CORN.

Part IV of Bulletin No. 141 of the Bureau of Plant Industry of the United States of America has been recently issued under the above title. Its contents are of much interest to all those who are engaged in attempts to improve corn by breeding and selection. The special importance which attaches to it is that it points out, in an unmistakable manner, the dangers of attempting to improve corn by narrow breeding. Corn is not a plant which, like wheat, is close-bred under natural conditions; on the contrary, its floral arrangements are such as will give almost the best chance for cross-fertilization. Again, uniformity of variety is not a requisite in the case of corn, as it is in those of the sugar-beet or tobacco. Finally, if narrow breeding is conducted with it, the unnatural mode of reproduction will cause deterioration of the seed—the very part of the plant that gives it a value. Breeding on narrow lines must therefore be avoided in all attempts to effect an improvement in corn.

In the bulletin to which reference is made, particulars are given as to a way in which broad breeding in corn may be carried out simply and easily. These may be tabulated as follows:—

(1) For the purpose of obtaining hybrid seed, plant two distinct varieties in alternate rows and detassel the plants of one of the varieties.

(2) Use the seed from the detasselled variety for the next year's general planting.

(3) Keep the seed from the different cobs of the variety that was not detasselled separate.

(4) Make selections from this seed (3) for the purpose of supplying the breeding-plot for the next two crops.

(5) Obtain a stock of pure seed of the other variety (that is the variety that was not detasselled at first), in the next crop, by detasselling it.

It is seen that, in this way, pure stocks of seed of the two varieties may be maintained. During every crop, there would be obtained: (1) a stock of hybrid seed for the general planting of the next year, (2) a stock of pure seed of one of the varieties for planting in the breeding plots during the next two crops.

The same result may be obtained approximately by planting in the way described above and detasselling each of the varieties in different halves of the field. In this method, however, the crossing that takes place is not under such rigid control, so that it is not recommended for adoption in definite breeding experiments.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated March 4, 1910, gives information as follows:—

The weather during the last part of the fortnight has been very wet, and as a consequence, deliveries of rice to town have been reduced.

Prices have remained firm, and we look for higher prices in the near future.

Shipments to West Indian islands during the fortnight amounted to 4,593 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 16*s.* 9*d.* to 17*s.* 9*d.* per bag of 180 ℔. gross.
15*s.* 9*d.* to 16*s.* 9*d.* „ „ „ 164 ℔. „

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 28, with reference to the sales of West Indian Sea Island cotton:—

During the past fortnight West Indian Sea Islands have been in good request, and prices are hardening.

The sales amount to about 150 bales, and consist of Montserrat 18½*d.* to 19*d.*, Barbados 19*d.* to 19½*d.*, St. Kitts 18*d.* to 20*d.*, Nevis 19*d.* to 20*d.*, Tobago and Anguilla at 19*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 19, is as follows:—

During the past week the factors showed more disposition to sell, and consented to make some concession in price, provided they could sell largely, as the planters were desirous of disposing of the cotton, so as to settle their accounts, and to make preparation for the planting of the next crop. This resulted in the above large sales on a basis of Fully Fine 32c., Extra Fine 33c., the buying being principally for export. Besides, several planters' crop lots have been sold for France at prices ranging from 34 to 37c. The unsold stock is now reduced to about 1,500 bales, of which about 1,000 bales are planters' crop lots held at 40 to 50c.

THE PREPARATION OF LAND FOR COTTON PLANTING.

It should be a well recognized fact, by now, that all old cotton must be removed from the land as early as possible, if the best approach to immunity from pests, in succeeding crops, is to be obtained. To leave the old cotton in the field until just before the new crop is planted is a mistaken policy, as it has been well proved that such action does not effect much in minimizing the risks of infection of the succeeding plants. (See *Agricultural News*, Vol. VIII, p. 312.) A good method for destroying old cotton is given in the *Agricultural News*, Vol. VIII, p. 166. It consists in pulling up alternate lots of six rows in extent, leaving them to dry for a few days, and then taking out the cotton that is left; the green and the dry stems are then burnt together.

On land where it is intended to plant cotton again, for the next season, there is a further reason for the early removal of the old plants. This consists in the fact that they must be out of the way if the land is to be properly prepared for sowing the next crop. Such preparation would advantageously include the growing and burial of a green dressing crop. In any case, the soil should be thoroughly well cultivated, and should receive a dressing of a suitable manure.

In connexion with the question as to what manure is suitable for the purpose, advice on this subject has often been given by the Department. Experiments that have been conducted for the purpose of ascertaining the special manurial requirements of cotton in the West Indies have not, so far, given any definite results; it would appear that the different manurial constituents that should be supplied to this plant were present already, in the proper proportions, at the time of its recent introduction, and there is little or nothing to indicate the exhaustion of these. There are, however, two important considerations which will make it evident that the application of manure, or green dressings, is advisable. The first of these is that, if the soil is to be kept in a good state of tilth, it must be supplied with a certain amount of organic matter. The second consideration is that manuring is not practised for the benefit alone, of the immediately succeeding crop, but that it has a further object, namely, to keep up the fertility of the soil in a general way; so that the estate on which it is practised may be prevented from 'running down'. These facts lead to the conclusion that land which is intended for cotton should receive a dressing of pen manure before tillage operations are commenced.

The amount of tillage required will naturally depend upon the nature of the last crop that was removed from the land. If this was sugar-cane (especially ratoons) or a crop like corn, much more cultivation will be required than for cotton following ground provisions, such as yams and sweet potatos, the reason being that the harvesting of the latter kind of crop entails, in itself, a certain amount of tillage.

Where the amount of organic manure that is available for application is limited, the employment of artificial manures is necessary. For particulars as to the quantities of these that should be used, see the *Agricultural News*, Vol. IV, p. 182, and Pamphlet No. 45, of the Department Series, entitled *A B C of Cotton Planting* (enlarged edition).

The conditions that govern the methods of tillage and manuring will vary in different places, so that the manner of effecting these can only be indicated in a general way. Past experience, however, seems to allow little doubt to exist as to one matter of advice. Land must be ready for planting in the month of June, and if, during that month, or soon after its end, there is not sufficient rain to warrant the sowing of seed, it is advisable to give up the attempt to raise cotton during that season, and to replace it by some other suitable crop.

POULTRY NOTES.

FEEDING POULTRY WITH CORN.

The following article, which deals with the effect of feeding an excess of corn (maize) to poultry, is reproduced, in the *Journal of the Jamaica Agricultural Society* from *Farm, Field and Fireside*:—

A very common mistake made by poultry keepers is that of feeding their birds on too much corn (maize). Too much maize is not good for fowls, as it brings on liver disease sooner than anything we know. It makes the bird too fat internally, and also makes blood too fast. Fowls that are fed liberally upon it are lined with yellow fat, especially in the abdomen, sometimes to the thickness of half an inch. The consequence of all this is that the egg organs become so weak that the hens lay eggs without shells. These are not the worst effects of feeding on maize, as birds that are so treated are generally in a weak condition, and so they are susceptible to many other affections and diseases, especially cold and roup. It is not always liver disease that actually kills them, but in consequence of the derangement of that organ, the birds get into such a state that diseases soon lay hold upon them and overcome them, because they are too weak to withstand the ravages of the disease.

In some instances where we have found cases of roup that have proved to be incurable, we have seen, on examination, that the liver was diseased, being full of tuberculous matter and with white spots upon it. Sometimes these spots are only as large as a pin's head. In most cases where roup has not yielded to treatment, we have found this tuberculous liver existing, and, in some instances, tumour, the growth of which the maize is very likely to stimulate. In cases where only ordinary scrofula is coming on, tuberculous substance forms, at first, in small yellow spots, and these grow rapidly, so that in a very short time they are a quarter of an inch through, and the liver is more than three times the ordinary size. We have weighed a liver of from 9 to 11 oz., the normal weight being from 2 to $2\frac{3}{4}$ oz. Another cause of a great deal of liver disease is inbreeding. More fowls die of this disease than the others put together.

Insufficiency of small grit, feeding on Indian corn, inbreeding, and bad ventilation are the four greatest foes to success in poultry yards. We have known instances where farmers have used maize for years together, and it has had such a bad effect upon the progeny that scarcely a chicken of all that were hatched lived. They died, many of them, when from four to six days old, some living until they were from three to six weeks old.

Poultry keepers use maize (corn) because it is a cheap food, and fowls seem to prefer it to any other, but they have to pay very dearly for their fancy, and only the bare, sad facts will convince them of the danger of using too much. A little corn for a change does not hurt the fowls, especially in the cold weather, but as a regular diet it should never be used.

In commenting on this, the *Journal of the Jamaica Agricultural Society* points out that the particular corn to which reference is made is American corn, which contains a larger proportion of starch than the ordinary West Indian varieties. After mentioning that a constant diet of the latter, even, will not give the best results, it suggests that, where it is difficult to get other food for poultry than corn, the latter should be parched, and fed in that state for three or four days at a time.

FOREST POLICY IN HAWAII.

There are in Hawaii two main classes of forest land, which, for the sake of convenience, have been termed the 'water-bearing forest' and the 'commercial forest'. The water-bearing forest is situated for the most part in the windward districts, and covers the watersheds and catchment basins of the streams that are needed for irrigation, power development and other economic uses. The chief value of this forest is that it protects the headwaters of these streams. Its most important product is water, and the treatment indicated for it is therefore the one which will best serve to produce the largest quantity of water.

This class of native Hawaiian forest belongs to what is known as the 'rain-forest' type, common in the tropics. To render to the full its beneficial service as a conservator of water, it is essential that the forest cover be kept strictly intact; for, owing to its character and composition, the Hawaiian forest is easily damaged by the inroads of cattle and other enemies. The method of management best adapted to secure the result desired with this class of forest is to keep it as a 'protection forest', from which men and animals are strictly excluded. Only by so managing it, can it be made to yield permanently the largest share of its most valuable product— water. All but one of the sixteen forest reserves so far set apart are in the water-bearing forest class. They are therefore to be considered and treated as protection forests.

The other main class of Hawaiian forest—the commercial forest—is found for the most part in the districts on the leeward side of the island of Hawaii, where, from the nature of the topography, and the remarkable porosity of rock and soil, there are no permanent running streams, and only occasional springs. In such districts it is obvious that the protection of watersheds does not figure. Consequently, the chief value of the commercial forest lies in the wood and timber which it can be made to produce. Fortunately, over a considerable portion of the commercial forest, reproduction can be secured through natural means, so that successive crops of valuable timber can be obtained, provided the forests are managed in accordance with the dictates of practical forestry.

Important as the commercial forest is, it should be clearly borne in mind that, in Hawaii, the water-bearing forest is far and away the more important of the two classes, and that wherever it (the water-bearing forest) occurs, it should, because of its relation to the economic development of the territory, not only be carefully protected, but so managed that it may be of the greatest use possible. (From the *Report of the Board of Commissioners of Agriculture and Forestry*, Hawaii, 1908.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial, the consideration of the Problem of Agricultural Education is continued, special attention being paid to the means by which such education should be given.

Information as to the state of the nutmeg industry and the feasibility of putting nutmeg oils on the market is presented on pages 84 and 85.

Special attention is drawn to the article, on page 85, entitled The Importance of Broad Breeding in Corn. It is of particular interest to those who are working with the object of obtaining improved varieties of corn.

A general account of the preparation of land for cotton-planting appears on page 86.

The Insect Notes, on page 90, contain the concluding article on Carbon Bisulphide, thus completing the account that has been given in two articles.

On page 94 appears the second part of the series of articles that are being given under the heading Fungus Notes, entitled The Chief Groups of Fungi. It should be stated that Figs. 9 and 10 are reproduced after Woronine, and Figs. 11 and 12 after de Bary.

Interesting conclusions regarding the manuring of land with lime and magesia are given on page 95.

Publications of the Imperial Department of Agriculture.

The third number of Vol. X, of the *West Indian Bulletin* is now being issued. This is largely taken up with matters relating to the diseases of plants. The first article, which is by H. A. Ballou, B.Sc., deals with Legislation that Exists in the West Indies for the Control of Pests and Diseases on Imported Plants; the second, by C. K. Bancroft, B.A., has for its subject The Chief Fungi Causing Diseases of Cultivated Plants in the West Indies. This article is illustrated by a plate showing *Sphaerostilbe flavidum*, Massee, and is followed by a short paper on Manurial Experiments with Cotton in the Leeward Islands, by H. A. Tempany, B.Sc. In the next article, which is by A. H. Kirby, B.A., information is given concerning the Rainfall of Nevis and Antigua. As a last article, the subject-matter is reproduced of a leaflet, recently issued by the Department, containing a revised syllabus of the Courses of Reading and Examinations in Practical Agriculture.

There is also being issued Pamphlet No. 64 of the Department series. entitled *Manurial Experiments with Sugar-Cane in the Leeward Islands*, 1908-9.

The *West Indian Bulletin*, Vol. X, No. 3, and Pamphlet No. 64, may be obtained of all agents for the sale of the publications of the Department, Price 6*d.*, post free 8*d.*, and price 4*d.*, post free 5*d.*, respectively.

The Qualities of Palm Oil.

An article in the Bulletin of the Imperial Institute, Vol. VII, p. 388, states that Palm Oil (from *Elaeis guineensis*), when freshly obtained by the natives, is a pleasant-smelling and yellow-coloured fat, which is often an article of food among Europeans living in West Africa. Owing to the little care that is taken in the preparation of the large quantities of oil that are exported, as well as to the time taken for its transport, it arrives on the European market in a very rancid condition. The chief impurities in the exported oil are water, sand, red clay and banana flour. If on reaching England, the amount of water and sand exceeds 2 per cent. of the bulk, an allowance for 'dirt' is made by the seller.

The consistence of the oil varies, according to its source, from that of butter (Lagos oils) to that of tallow (Congo oil); the colour of the various kinds of oil ranges from orange-yellow (Lagos) to dirty dark red (Congo), or even grey and brown (Saltpond and Dixcove). This variation in colour is due to local differences in methods of preparation, and other causes. The nature of the colouring matter has not been determined; it slowly disappears on exposure to air. The oil is bleached, on the manufacturing scale, by heating it to 150° C., and passing air through it, or by means of bichromate of potash and hydrochloric acid.

The above information refers to the oil obtained from the fruits. Oil is also extracted from the kernels, in Europe, by expression, or treatment with solvents. It is also prepared on a small scale, according to crude methods, by the natives of West Africa, but this oil is not exported.

Bonuses for Stock Importation, St. Vincent.

A notice has been issued recently in St. Vincent to the effect that, in order to improve the breed of island ponies, the Government will award a bonus of £10 per head to importers of a limited number of suitable brood mares, after February 14, 1910.

The following are the conditions which must be complied with for the granting of the bonus: (1) the mare must pass an inspection, three months after arrival, by the Government Veterinary Surgeon, whose certificate as to its fully meeting requirements must be obtained; (2) the mares must be 14.2 hands, or over, not more than six years old, and from a thoroughbred stock: (3) the number of mares for which a bonus will be paid is four: no person can obtain a bonus for more than one mare: (4) those desiring to import a brood mare to compete for the bonus should notify their intention to the Government Veterinary Surgeon before, and on, the arrival of the animal in the Colony: in the event of the receipt of more than four applications, these will be dealt with in order; (5) the recipient of a bonus must have the animal, on whose account it is paid, vaccinated, and must undertake that it shall not be exported for at least three years.

'Tackiness' in Rubber.

An article appears in *Le Caoutchouc et Gutta Percha*, for September, 1909, on the tackiness of different kinds of rubber. For the purpose of determining this, an examination was made of a large number of rubbers in the Musée d'Histoire Naturelle, l'Ecole Superieure de Pharmacie de Paris, and the Jardin Coloniale de Nogent-sur-Marne. It was found that the rubbers which were most unlikely to become tacky were *Hevea brazilensis* and *H. guianensis*. In regard to these, specimens collected in 1867, even, were in good condition. 'Sernamby' rubber, from Peru and Guiana was quite tacky, especially where it touched the glass vessel in which it was kept. With other rubbers, tackiness was shown as follows: Ceara, all samples tacky, except three; *Euphorbia Intisy* (Madagascar), all except two; *Castilloa elastica*, all samples; *Ficus elastica* (balls of scrap), all samples: *Ficus prolixa* (New Caledonia), one sample out of five less tacky than a ball of scrap of *F. albinervis* (Réunion); *Cryptostegia madagascariensis*, none tacky; *Marsdenia verrucosa* and *Hancornia speciosa*, both tacky; of the Landolphias, *L. Heudelotii* was the best of fourteen species which were examined; *Mascarenhasia lisianthiflora* and *M. longiflora* were not tacky; *Funtumia elastica*, *Willughbeia firma*, *Ecdysanthera rosea*, *Micrechites napeensis*, *Xylinabaria Reynaudi*, *Parthenium argentatum* (Guayule), *Lobelia elastica* and *Landolphia* [Vahea] *senegalensis* were all tacky.

It is suggested in the article that the tackiness of rubber depends, to a certain degree, on the methods employed for its coagulation.

Small Holders on Cattle Farms.

In Nevis, arrangements have been made by Colonel the Hon. R. Stapleton Cotton for working several estates as a cattle farm, and at the same time to provide holdings on those estates for small proprietors. The area of land available for this is about 50 acres, which will be let in ½-acre and 1 acre plots, for growing sugar-cane, provisions, or cotton. A rent of 10*s.* per acre is payable in advance, by each holder, on July 1 of every year, and until this rent is paid, no one will be allowed to commence cultivation. Before planting the land, occupiers must apply pen manure; as much of this as is required may be obtained from the Proprietor's cattle pen. In regard to the growing of sugar-cane, this will not be permitted to ratoon more than twice. Vegetable matter, such as cane tops, trash and vines, must not be removed, but consumed on the land. Finally, room will be provided on the estate for occupiers to tether animals belonging to them, and this privilege is restricted to such occupiers.

Elementary Agricultural Education in Eastern Bengal and Assam.

A copy of the *Report on the Operations of the Department of Agriculture of Eastern Bengal and Assam*, for the year ending June 30, 1909, has been received recently. It states, in regard to schemes for imparting agricultural instruction in elementary schools, that the Government of India has ruled that definite agricultural instruction is to form no part of the curriculm of these schools, but that what is wanted is the encouragement of the pupils to study plant life. After emphasizing the necessity of the possession of a small garden by each elementary school, it goes on to say that such a garden would not be used for the purpose of imparting definite agricultural knowledge, but simply to illustrate the various phenomena of plant life. To this end, the Director of Public Instruction is endeavouring to obtain sites for gardens to be used in connexion with both elementary and training schools. One of the duties of the Department of Public Instruction is to provide courses of nature study for the head-masters of training schools, and a preliminary step will be made in this direction by the training of a selected officer so that he may be capable of taking classes in nature study. So far, the scheme is only at its commencement, for the Local Government is in correspondence with the Government of India in relation to this subject, and it still remains to be decided what shall be the precise nature of the training that the selected officer shall undergo in order that he may be fitted to give information to others that will enable them to conduct nature study lessons.

It is interesting to note that in India, as well as in the West Indies, nature study, rather than definite agricultural teaching, is regarded as being most fitted for elementary schools.

INSECT NOTES.

CARBON BISULPHIDE.

Part II.

USE AS AN INSECTICIDE. On account of its peculiar properties, carbon bisulphide has only a limited application in the control of insect pests on plants. It may, however, be used for the destruction of borers in the trunks of trees, by injecting small quantities of it into the tunnels of those insects. Care should be taken, however, to distinguish tunnels from which the insects have already escaped, since it would merely be a waste of material to apply carbon bisulphide to such holes. Any clean, round hole in a tree infested by borers will probably be found to be the opening through which the adult insect has made its escape. Tunnels in which grubs are still to be found can be distinguished by the quantity of chips and excrement, and sometimes the gummy exudations, which indicate the position of their mouths. The introduction of a small quantity of carbon bisulphide into these tunnels will cause the death of the grub within, especially if the opening is immediately closed with wet clay, grafting wax or similar material. An ordinary machinist's oiler with a spring bottom will be found very useful for applying carbon bisulphide to borers in trees.

Another application for the control of insect pests is as follows: Small plants attacked by scale insects, plant lice and similar insects, can be covered over by tight boxes in which carbon bisulphide may be evaporated. The most convenient method of use is by means of a small opening at the top of the box or tent used for this purpose, through which the dose of carbon bisulphide is poured on to absorbent cotton or similar material, and the hole then stopped with a cork. If a box 10 or 12 inches in diameter be used, a dose of 1 or 2 teaspoonfuls of carbon bisulphide will be found sufficient. The covers should be left over the plants for three quarters of an hour to an hour, and if the amount of the dose is carefully calculated, the insects will be killed without injury to the plants.

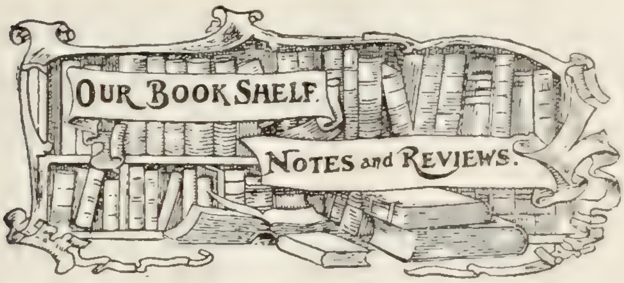
Seeds which are being kept for planting may be treated in the same way, using a box, or receptacle, of convenient size, and carefully estimating the amount of material to be used. In the case of clothes moths and other insects which attack stored woollens, furs, feathers, etc., these may be killed by storing these goods in a tight box or chest with an opening in the top similar to the one just described, through which carbon bisulphide may be poured, the hole being then closed by means of a cork. This will be found very efficient in protecting from attack all the articles mentioned, and such a chest or box may even be used for the fumigation of books, papers, food stuffs and all things that are liable to similar attack.

In using carbon bisulphide in the soil, it should be borne in mind that the direct contact of this material with the roots of plants is sometimes injurious, but when it is applied in comparatively small doses at a little distance from the plant, there is generally no ill effect. It has also been shown that it has no ill effect on the germination of seeds which have been fumigated, when the dose has been approximately twice as great as has already been mentioned. Perfectly pure carbon bisulphide does not stain laces, or any fine fabrics if it comes into contact with them; but the ordinary commercial material is not pure, and care should be taken not to spill it, when delicate clothing is being fumigated. Food stuffs are not injured; and the extreme volatility of the vapour ensures that a short period of thorough ventilation will serve to remove all disagreeable taste and odour.

In *Farmers' Bulletin* No. 145, of the United States Department of Agriculture, from which the foregoing is largely an extract, it is stated that, as a general rule, crops grown upon soil treated with carbon bisulphide are very good, and a short paragraph is devoted to speculation as to the cause of this favourable condition. Figures are given to show the considerable increase in the products from fields of corn and potatos treated with this substance, and it is mentioned that in a series of experiments with corn, oats, beets, potatos and clover, much the same results were obtained; but the marked increase was in the case of the clover. It was found that the vapour was not detrimental to the bacteria causing nodules upon the roots of this legume, but rather seemed to favour their multiplication. Furthermore, it was found, upon these same plots, that the beneficial influence of the treatment was quite apparent the following year, though less marked than the first year. These observations are of considerable interest in the light of more recent investigations. The editorials in two recent numbers of the *Agricultural News* (Vol. IX, Nos. 202 and 203) have been entitled 'The Balance of Life in the Soil', and have contained explanations of the results obtained by partial sterilization of the soil. The effects of soil sterilization have been calculated mostly in connexion with the abundance of soil bacteria, and the relation of the destruction of the beneficial bacteria to that of the injurious forms of protozoan and bacterial life. Carbon bisulphide is mentioned in these as one of the materials experimented with, and the beneficial effect derived from its use is believed to be the result of the partial sterilization produced by its action in the soil. In Antigua, experiments are now being carried out on two plots to determine the effect of carbon bisulphide in the soil, on the growth and yield of sugar-canes, and this substance has been experimented with, also, in Porto Rico and in other parts of the world.

Nematode worms are abundant in most, if not all, tropical soils, and are very likely responsible for more injury to plants than has generally been ascribed to them. The use of carbon bisulphide will probably greatly reduce the numbers of these minute animals, and experiments should show how great the injury from them has been.

Interesting information as to the employment of carbon bisulphide for the purpose of controlling the banana weevil borer (*Sphenophorus sordidus*) is given in the *Report on Agriculture in Fiji*, 1908. At first, attempts were made to free banana fields from the pest by applying tobacco refuse, soot and lime, gas lime, or the refuse from acetylene generators, but these were not successful. As is stated in the report, the treatment must be such as will kill the pests that are present in the suckers intended for planting, as well as those that are living in the old, growing ones, and such as will be capable of being employed in keeping the established plants free from the insects. The vapour of carbon bisulphide was observed to be most suitable for the purpose. It was found that the treatment of the suckers could be carried out quite easily in barrels, tanks or punts, or even in stacks in a room. In the case of the barrels, tanks or punts, the insecticide was applied in the way that has been indicated already in these articles; in that where the planting material had been piled into stacks, the latter were covered with heavy tarpaulins, and the treatment was then carried out in the usual manner.



MANURIAL EXPERIMENTS WITH SUGAR CANE IN THE LEEWARD ISLANDS, 1908-9. Issued by the Imperial Commissioner of Agriculture for the West Indies.

In the last number of the *Agricultural News*, a review was made of Pamphlet No. 63 of the series published by the Imperial Department of Agriculture, entitled *Seedling and other Canes in the Leeward Islands, 1908-9.* The pamphlet complementary to this (No. 64), dealing with the corresponding manurial experiments, is just being issued, so that a complete account, in pamphlet form, of the experiments with sugar-cane in the Leeward Islands, during 1907-8, is now available.

As is usual, the first part of the pamphlet is devoted to a description of the manurial treatment given to the canes, as well as of the rainfall and local conditions at the various experiment stations. The trials consisted, as in former years, of the twelve-fold repetition of thirty-three experiments with manures in different combinations. During the preceding season, a change was made, however, in the direction of substituting ratoon canes that had not received manure as plants for those which had succeeded plants which had been manured. The reason for this change is the desire to ascertain, by comparison with the results of former experiments, what effect manure, applied to the cane as plants, has on the ratoons which succeed. The experiments under the new plan have not been continued sufficiently long to give definite results, but there seems to be a probability that some manures, at least, that have been applied to plant canes have a residual action on the succeeding ratoons.

The results of the ordinary manurial experiments are presented in two tables, one of which contains the mean yields of twelve plots for the period under report (1908-9) and the other the mean yields of fifty-seven plots for five years. In addition, information relating to the profit and loss on manuring is given in each case. Both tables are illustrated by diagrams which give their chief contents at a glance.

In the report on similar experiments for 1907-8, a discussion on the tillage of ratoon canes was given, and in order to gain information in connexion with the matter, a series of experiments was devised during the season with which the pamphlet deals. The first results of these have just been obtained, but repetition to a fairly large extent is required before definite conclusions can be given, and it is therefore intended to effect this.

Other new work is concerned with the use of molasses for increasing the fertility of soil on which sugar-cane is grown. An interesting account is given of the experiments that have been initiated in connexion with this matter, and they have shown themselves to be of sufficient value to be continued during future seasons. It would seem that the beneficial effect of the molasses on the soil is not due so much to the manurial value of its mineral contents as to the stimulating action of its presence on the nitrogen-fixing organism *Azotobacter chroococcum.* The question of the advisability of treating the land with molasses is, of course, intimately connected with that of its value as a marketable product and, as is pointed out in the pamphlet, exhausted vacuum pan molasses is much more likely than muscovado molasses to be used for the purpose.

As regards the action of the molasses in increasing the yield of sugar-cane, more particularly, it is shown by means of a table that this increase was obtained at all except one out of the five stations where experiments were made, but, as has been indicated, further trials are required before definite information can be gained.

COMMON WEEDS OF THE FARM AND GARDEN. By Harold C. Long, B.Sc., and John Percival, M.A., F.L.S. *Smith, Elder & Co., London.*

The object of this book is to give detailed information in regard to the weeds that are found mainly in farms and gardens in the British Isles, and to suggest means by which they may be kept in check in the best manner. Its contents fall naturally into eight sections, as follows: (1) general information as to the nature, effects, and classes of weeds (Chapters I and II); (2) general preventive and remedial measures for weeds (Chapter III); (3) information in relation to special weeds and their habitat (Chapters IV, V, and VI); (4) parasitic and poisonous plants (Chapters VII and VIII); (5) weeds in localities other than pasture and arable land (Chapters IX and X); (6) the principles of seed-testing (Chapter XI); (7) bibliography; and (8) appendixes containing: (a) illustrations of weed seeds, (b) a list of weeds and poisonous plants, (c) legislation in regard to weeds, (d) birds and weeds, (e) recognition of the importance of seed-testing.

The above list serves to show that the subject is dealt with in a thorough manner. A perusal of the book confirms this opinion, and demonstrates the fact that British agriculturists are placed in possession of information, by it, that should be of the greatest use to them. In the West Indies, the chief interest will be taken in those parts of the work where the subject is treated in the most general manner, that is to say, with reference to the list given above: sections (1), (2), (6), (7), and appendixes (c) and (e). That the subject is treated fairly is shown by the circumstance that the usefulness, as well as the harmfulness, of weeds is given its due recognition. The preventive and remedial measures against weeds would seem worthy of wider trial, under West Indian conditions, than has so far been given to them. The principles of seed-testing are now well-known in this part of the world; attention may, however, be drawn to a useful form of seed-tester, made of porous ware, of which a description is given. The bibliography is broadly comprehensive, and contains references to more than one hundred and forty works, pamphlets or periodicals in which information relating specially to weeds may be found. As regards the account of the legislation enforcing the destruction of noxious weeds in the chief agricultural countries of the world, this is given in a concise and useful manner, as is that, also, on the recognition of the importance of seed-testing.

In addition to three plates presenting illustrations of nearly eighty different seeds of weeds, the book contains more than one hundred reproductions of photographs and sketches. The index is good, and the volume, altogether, forms a useful model of what such a work should be.

GLEANINGS.

In the February number of the *London Magazine*, there appears an interesting illustrated article, by Mr. J. R. Jackson, A.L.S., on tobacco-growing in Jamaica.

During December 1909, the value of the sugar imported into the United States was $2,400,000; in December 1908, it was $2,100,000. Similarly, the figures for the complete years were $90,000,000 and $88,900,000.

The principal export of Venezuela—coffee—reached a weight of 6,784 metric tons during 1908; in the previous year it was 8,315 metric tons. The similar figures for cacao were 5,700, and 7,059, metric tons.

The exports of sugar and copra from Fiji, during 1908, were respectively, 66,149 tons, of a value of £647,306, and 12,931 tons, valued at £154,488. The similar quantities and values for the preceding year were 66,597 tons and £602,820, and 11,290 tons and £182,788.

At the end of 1908, there were in Servia 282 affiliated Raiffeisen banks, with 9,082 members, of which 8,161 were peasants. At the end of 1908, 12,960 loans had been advanced, of which 7,352 were between £4 and £12. (The *Cyprus Journal*, January 1910.)

A company has been registered recently for the purpose of carrying on the business of cultivators of coffee, cacao, rubber and other produce in Trinidad. Another object of the company is to acquire the commercial interests of the late Mr. Louis Bert de Lamarre, in Barbados and Trinidad.

Last month's issue of an American trade journal states that there does not seem to be any weakening in the broom corn position since January; prices have an upward tendency, though the change is not great. It appears that, on all accounts, the price of broom corn of the present crop will be high, and that the product will be scarce.

The results of the Intermediate Examination held in connexion with the Courses of Reading, on November 1 and 2, 1909, which were given in the *Agricultural News*, Vol. VIII, p. 381, may be now completed by the statement that R. W. Niles, of St. Lucia, obtained a First Class certificate, with Cacao and Cotton as special satisfactory subjects.

The distribution from the Antigua Botanic Station, during the month of January 1910, was as follows: cane plants 26,415, sweet potato cuttings 22,000, limes 1,400, cocoa-nuts 258, Eucalyptus 44, Casuarina 43, grafted mango 1, miscellaneous economic plants 24, miscellaneous decorative plants 53, miscellaneous cuttings 150, broom corn seed 100 lb., miscellaneous seeds 9 packets and 1 bag.

Paris green is essentially copper aceto-arsenite and, if pure, should have the following equivalent composition: arsenious oxide 58·65 per cent., copper oxide 31·29 per cent., acetic acid 10·06 per cent. In seventeen samples examined at the New Jersey Agricultural Experiment Stations, the arsenious oxide was from 2 to 4 per cent., and the copper oxide from 1 to 4 per cent., below these proportions.

The *Report on the Progress of Agriculture in India*, for 1907-9, states that further trials with tree cottons have confirmed the opinion that they will never enter into regular cultivation in India. Most of the experiments with them have failed, and have been abandoned since March 1909. A small amount of success has, however, been obtained in some parts of India, but it is said that the place of tree cotton as a field crop in Indian agriculture is very limited.

In the *Agricultural News*, Vol. VIII, p. 284, it was stated that a reward of £5,000 had been offered for a good method of exterminating the white ant (*Termes Gestroi*) in the Federated Malay States. It has been announced recently, in the *Agricultural Bulletin of the Straits and Federated Malay States*, that after careful consideration of the applications by the committee appointed to adjudicate, it was decided that none of the remedies suggested were suitable for the reward, and that this has now been withdrawn finally.

Goods were exported from the colony of British Guiana, during 1908-9, to the value of £2,104,176; the value of those produced and manufactured locally was £1,958,509. During the preceding period, the values were, similarly, £1,711,543 and £1,545,303. Sugar and its by-products continue to be the main article of export, representing during the period 1908-9, 75 per cent. of the total produce. The sugar crop reached 115,212 tons; in 1907-8 it was 100,737 tons. The area under sugar-cane was 71,310 acres, as against 70,986 acres in 1907-8. (*Colonial Reports—Annual*, No. 632.)

The correct botanical nomenclature of the plants yielding commercial cottons has provided much subject for controversy. A recent paper communicated by F. Fletcher to the *Cairo Scientific Journal* (November 1909) discusses the botany and origin of American Upland cotton. Evidence is adduced for the opinion that this well-known plant does not show the characters indicated by Miller's type of the species *hirsutum*, but conforms to the description and drawings issued by Tenore for *Gossypium siamense*. The author states that *G. religiosum* of Linnaeus also refers to the Upland plant, but gives reasons for disregarding this specific name in favour of the former. (*Nature*, February 3, 1910.)

According to the *India Rubber World*, an estimate by the firm of Messrs. Dick, Brothers & Co., of New York, places the annual sale of cotton duck for use in rubber belting and all kinds of rubber hose at 50 million yards. It is also estimated that the annual demand for cotton for use in motor car construction is 325,000 bales, of which 290,000 are used for making the cotton duck basis for the tyres, the remainder being chiefly employed in the manufacture of artificial leather cushions and seats. Reference is also made to the use of cotton in manufacturing the material for insulating electric wires. It should be stated that Sea Island cotton is especially suited for these purposes, as for all others where strength of fibre is a particular requirement.

STUDENTS' CORNER.

MARCH.

SECOND PERIOD.

Seasonal Notes.

The observations that should have been conducted recently on the sugar-cane in the field will have shown that some varieties of cane ripen earlier than others, and notes should have been made of the behaviour of different kinds, in this respect. By what indication is it known whether a cane is ripe, or not, and how is the state, as regards ripeness, determined? Opportunities are now being given for making notes on the milling qualities of canes. On what properties of the cane do these depend? Of what importance, in relation to the manufacture of sugar, is the milling quality of a cane?

One of the chief essentials of the best sugar-making is cleanliness. In order that this may be obtained, care should have been taken that the boiling-house is kept clean, that puncheons and coolers are free from all dirt or refuse from the process of sugar-making, and that all unnecessary cracks and crevices in these should be filled. What is the reason for this, and what results are likely to accrue through the presence of dirt in the boiling-house and in packages?

In muscovado boiling-houses, in some cases, syrup will be manufactured instead of sugar. What is the difference between boiling juice to syrup, and boiling it to sugar? What is meant by the statement that, in order to prevent the crystallization of sugar from juice that is being heated (evaporated), a certain amount of inversion must take place?

Where onions are grown, note should be made of the way in which the crop is harvested and prepared for shipment. Why should onions be allowed to dry before they are shipped? Study the methods that are employed for packing onions. Why is it advisable that a package should be made that is neat as well as strong. What is meant by grading onions? Observe that only those onions should be exported that are of a size suitable to the market on which they are placed.

Consider the question of the more frequent employment of onions as a rotation crop. Discuss the advisability of planting onions where a dry season has prevented the early sowing of cotton seed.

Summarize the reasons for giving shade to plants, and discuss the question of providing shade for cacao. What are the effects of too much shade, on a plant? How are fungi enabled to flourish in the absence of light, and what does this fact suggest in relation to the matter of preserving the health of plants?

Lime plants in nurseries will require attention at the present time. If they are suffering from drought, the surface of the soil should be worked up to a fine, loose mulch. What is the precise way in which this lessens the rate at which water is lost from the soil by evaporation? The soil in the nurseries should be well drained, in order that the water from heavy showers of rain that may fall may run off easily, and not leave the soil waterlogged. As is well known, seedlings in a soil that is too wet suffer from 'damping off', which is a disease due to a definite fungus. If this disease has already attacked the seedlings, a large proportion of them may be saved by spraying them with Bordeaux mixture. (See *Reports on the Botanic Station, Agricultural School, and Experiment Plots, St. Lucia*, 1908-9, p. 15.)

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why, in preparing a cutting of a plant, is the portion that is used cut across diagonally, and why are some of the leaves removed?

(2) In what does the value of cotton seed meal as a manure, consist? How is it used as manure?

(3) Describe the functions of roots.

INTERMEDIATE QUESTIONS.

(1) How is the air-space in a soil related to the fineness of the particles?

(2) Give a sketch of the life-history of the moth borer of the sugar-cane, and state what steps may be taken to control this pest.

(3) What manures are necessary or desirable for lime trees? State the quantities in which they should be used.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Tuesday, March 15, by the R.M.S. 'Esk', on an official visit to St. Lucia. Dr. Watts will probably return to Barbados by the same steamer on the 22nd instant.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, left for Montserrat by the SS. 'Ocamo' on March 5, for the purpose of making investigations in connexion with insect pests in that island.

Mr. F. W. South, B.A., Mycologist on the staff of the Imperial Department of Agriculture, also left for Montserrat at the same time, for the purpose of making investigations in connexion with insect and plant diseases there.

Messrs. Ballou and South returned to Barbados, by the SS. 'Oruro', on March 17.

Silk Cotton Seed as a Cattle Food.

Experiments are mentioned, in the *Philippine Agricultural Review* for August, 1909, which have been conducted with the seed of the silk cotton, or kapok, tree (*Eriodendron anfractuosum*), with the object of comparing the value of cake made from this seed with that of cotton seed cake, as a cattle food. The results of analysis were as follows:—

	Silk cotton seed cake, per cent.	Cotton seed cake, per cent.
Water	13·28	12·00
Albuminoids	26·34	20·62
Fat	5·82	6·36
Digestible carbohydrates	19·92	35·02
Fibre	28·12	20·36
Ash	6·52	5·64

The analysis also showed that the ash of the silk cotton seeds contained 20·6 per cent. of phosphoric acid (as P_2O_5) and 24·6 per cent. of potash (K_2O).

The results are interesting, as far as they go, but require to be supplemented by actual feeding trials.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part II.

THE SIMPLEST FORM OF PLANT LIFE. All the processes of life are invariably connected with a peculiar colourless, jelly-like substance of a very complicated structure, and containing very many different chemical compounds. This substance is known as protoplasm. Generally, a small portion of this, which is even of a more complicated nature than the rest, is separated from it, and is denser. It is usually spherical in shape, and is known as the nucleus. The nucleus is that part which controls all the different physical and chemical processes which take place in the rest of the protoplasm. Many of the simplest forms of life, therefore, consist of a more or less shapeless mass of the jelly-like substance of a very minute size, which contains one or more nuclei. Such forms of life are most frequently met with in water, as there they are less exposed to sudden changes of temperature, or to any danger of drought, or of encountering strong solutions of chemical substances, which might injure the protoplasm. Frequently, these minute living bodies are of a definite egg-shape, and have attached to their sharper end one or more very fine, thread-like outgrowths. Such a thread is known as a cilium. It possesses the power of independent movement, and by lashing about in the water enables the organism to swim, in this way giving it a better chance of obtaining its food. If, to such an organism as the one just described, the green colouring substance known as chlorophyll is added, we obtain the very simplest form of plant known. Such a plant is complete in itself, and can obtain all its food-supplies from the chemical substances dissolved in the water in which it lives. It swims about for some time, until it attains a certain size, after which it divides longitudinally down the middle into two plants, each containing a nucleus formed from the original one, together with half of the original protoplasm and chlorophyll.

Fig. 9. Zoospores of *Olpidium brassicae*.

Now the fungi, as is well known, are plants which have lost the power of forming their own chlorophyll, and consequently they cannot obtain carbon from carbon dioxide gas. Thus they must get it from other organisms, either dead or alive. If such a simple form of plant as has been described above were deprived of its chlorophyll, it would be the simplest possible form of fungus. Now, if this fungus had to live in the interior of some other plant, the naked protoplasm might be exposed to harmful chemical substances given off by the host plant. To guard against this, it covers itself with a firm outer coat, or wall, which is very resistant to such substances. These fungi, consisting of a cell wall, protoplasm, and a nucleus, and nothing further, are found among the members of the group Chitredineae. Some of these fungi live in the cells of various higher plants, and cause a considerable amount of damage to them; for example, *Olpidium brassicae*, which causes a disease of young cabbages. The full life-history of the fungus is as follows: It consists of a naked mass of protoplasm, with a nucleus and one whip-like outgrowth, or cilium, attached to its pointed end. It swims about in a drop of water on the surface of the cabbage, and eventually bores its way into the tissues, becomes spherical, and covers itself with a cell wall. It grows, and finally produces a long tube, which penetrates to the surface of the host plant, and projects into any drops of water that there may be on the surface. Meanwhile, the contents of the spherical portion have divided up into numerous minute, free-swimming bodies or *zoospores* (Fig. 9), each exactly like the first stage of the original plant. The central, spherical portion of the parent fungus, in which the zoospores were formed, is known as a *sporangium* (Fig. 10). The zoospores are discharged through the neck, swim about as before, and finally penetrate the host plant again and repeat the life-cycle.

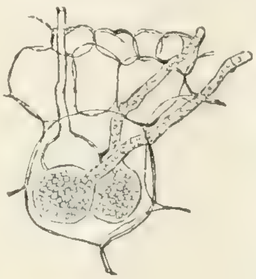


Fig. 10. Sporangium of *Olpidium brassicae*.

Fig. 11. Ascus with Ascospores.

The next step in the development of the fungi from the simplest forms, is the formation of long fine threads, which penetrate the substratum in search of food. These threads are usually without cross walls in the simplest forms, but possess them in the more elaborate ones. Each thread is known as a hypha, and the whole system of them as the mycelium. The reproductive organs are only borne on certain parts of these threads.

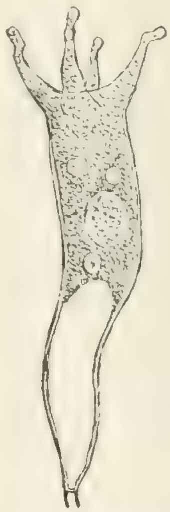


Fig. 12. Basidium, with sporidia.

The more elementary fungi require moisture for their reproductive purposes, and in this way show their relationship with the more primitive form of plant which lived in water. In the course of ages, however, these reproductive methods became very much altered, so as to enable the plants to live more conveniently on land, and to reproduce themselves independently of the presence of moisture. How this came about will be shown in discussing the various groups.

THE MAIN GROUPS OF FUNGI. The fungi are divided into four main groups, chiefly in accordance with the characters of their reproductive organs. These groups are as follows:—

The Phycomycetes.—The vegetative mycelium of the members of this group never forms a compact mass, but usually branches in the tissues of the plant or animal upon which these fungi generally live. Some of them exist saprophytically on decaying substances, but the majority are parasites. There are two forms of reproduction: the first by means of conidia, which germinate either by dividing up to form free-swimming spores, or zoospores, as described for the Chitredineae, or by producing a mycelial tube direct; the second by means of thick-walled, resting spores produced as the result of a sexual process.

The Ascomycetes.—In this group, the mycelium may be either entirely buried in the substratum, or may form

a compact mass known as a stroma. The kinds of reproduction may be numerous, but can usually be divided into two classes. In the first class are conidia of various forms, borne on the ends of hyphae, often themselves arranged in some special manner, but almost always freely exposed to the air and not contained in any special receptacle. In the second class of reproduction, there is one constant feature, the presence of an ascus, or elongated sac, which contains generally eight, sometimes four, ascospores (Fig. 11). These asci were almost certainly all produced as the outcome of a sexual process in the earlier forms, but many fungi have now entirely lost this sexual process. The asci are found free in the simplest forms, but in the more elaborate ones they are either produced in a closed box, or perithecium, or in a mass on the surface of an expanded disc, which is often rolled up into a closed body when young, but which opens and exposes the mass of asci when ripe.

The Basidiomycetes.—This group is characterized by the presence of a special cell, or *basidium*, on which the reproductive bodies, or *sporidia*, are borne. This special cell may, in the simpler forms, be divided up by cross walls, and then each compartment produces one or more sporidia. In the higher forms it is non-septate, and produces two, or more, generally four, sporidia borne on short stalks, which project from the upper surface of the basidium (Fig. 12). The basidia are generally produced on some form of fruit-body, either exposed, as in the toadstools, or enclosed in a bag or sac, as in the puff balls.

The Fungi Imperfecti.—In this group are very many species of fungi, which, so far as is known, can only reproduce themselves by some form of conidial fructification. Many of them have been shown in recent years to be only the conidial stage of an ascomycetous fungus, and there is no doubt that some form of higher fructification will be found for many more of them, as our knowledge of these plants increases; but at present, they have to be given separate names for purposes of classification.

These, then, are the four main divisions of the fungi. More detailed information of the various groups will be given in the subsequent articles.

MANURING WITH LIME AND MAGNESIA.

Experiments on manuring with lime and magnesia have been conducted in recent years at the Porto Rico Agricultural Experiment Station. The following are some of the results, both theoretical and based on the experiments, as set forth in Circular No. 10 of that station:—

(1) It is always an unfavourable condition when the magnesia content of a soil is essentially higher than the lime content. For many plants it is also unfavourable when the lime content is more than three times as high as the magnesia content.

(2) Since, by the application of farmyard manure, sufficient lime and magnesia are supplied in easily available form, the original lime-magnesia ratio in the soil does not play such a significant part as in the case of mineral manuring where potash, phosphates and nitrogen are added.

(3) Most kinds of cereals develop best when the lime content is equal to the magnesia content, or does not exceed this proportion.

(4) Leguminous plants, and probably many others, require relatively more lime than do cereals, the lime-magnesia ratio being here more favourable.

(5) Plants, like tobacco and the grape, which can exclude an excess of absorbed lime from further physiological influence by precipitation as calcium oxalate in the cells of the leaves and stem, can also show a very favourable development in such cases where the lime content of the soil exceeds the magnesia content by more than three-fold. However, there is a limit in this respect, since the regulative powers of the plants are imperfect.

(6) An application of pure limestone on poor sandy soils has often caused a decreased harvest, to the surprise of the owner. It may be safely assumed that in such cases, the magnesia content of the soil was far below the lime content, and that an increase of lime rendered, therefore, the ratio of lime to magnesia still more unfavourable than it was.

(7) From a practical point of view, the ratio of 2 parts of lime to 1 part of magnesia in the soil would be the most desirable, since this approaches on the one side the best ratio of lime to magnesia, for cereals, and on the other, the best for the leguminous plants.

(8) The lime-magnesia ratios mentioned thus far, hold good for the condition where both bases are present in the same state of availability. If, however, the one should be present in a water-soluble form, and the other in a form not soluble in water, then the ratio entering the root would of course differ from the ratio present in the soil, the former being capable of rapid absorption by the plant, the other not. This point is especially important when manuring is considered.

(9) Some care has to be exercised in manuring with magnesium sulphate. Clayey and loamy soils can be treated at first with 200 to 500 kilos. per hectare (176 to 440 lb. per acre), eventually with more; but on sandy soils such large doses would not be advisable, partly because the sulphate may be lost again by leaching. Smaller doses, applied annually, are preferable. The most effective form of application is a top dressing with dilute solutions.

(10) In cases of an excess of magnesia over lime in a soil, it will be of great advantage to apply the nitrogen in the form of calcium nitrate, or as the so-called lime nitrogen (calcium cyanamide), since in this way a special manuring with lime may be avoided. When calcium nitrate or lime nitrogen is applied on soils too rich in lime, then magnesium sulphate should be applied in conjunction with it.

(11) When heavy clay or loam soils have to be loosened by liming, the ratio of lime to magnesia in the soil should be considered. Accordingly, pure limestone should be applied when the magnesia content in the soil is higher than that of the lime, while magnesian limestone should be used if the reverse is the case. Thus at the same time, the soil is loosened and the ratio of lime to magnesia improved.

(12) It is also necessary to consider the ratio of lime to magnesia when correcting the acid or alkaline reaction. Soils of alkaline reaction should receive gypsum for neutralization, if the magnesia content is higher than that of the lime, and magnesium sulphate when the magnesia content is too far below that of the lime.

(13) It may happen that loosening a heavy clay soil, or neutralizing the acidity of a soil will have a much more powerful influence on the productiveness than the correction of the ratio of lime to magnesia, but this is no reason why an additional advantage should not be secured when those evils are remedied.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, March 1, 1910; Messrs. E. A. DE PASS & Co., February 4, 1910.

ARROWROOT—1⅞*d.* to 3¾*d.*
BALATA—Sheet, 2/7; block, 2/2½ per lb.
BEES-WAX—£7.
CACAO—Trinidad, 53/6 to 62/- per cwt.; Grenada, 49/6 to 55/- per cwt.; Jamaica, 47/- to 52/-.
COFFEE—Jamaica, 39/- to 59/-.
COPRA—West Indian, £25 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; St. Croix West Indian, no quotation.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 52/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 10*d.* to 1/-; concentrated, £18 to £18 5*s.*; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—Steady.
PIMENTO—Common, 2¼*d.*; fair, $2\frac{5}{16}$*d.*; good, 2⅜*d.* per lb.
RUBBER—Para, fine hard, 8/9, fine soft, 8/6; fine Peru, 8/7½ per lb.
RUM—Jamaica, 2/4 to 5/-.
SUGAR—Crystals, 16/3 to 18/9; Muscovado, 13/3 to 15/3; Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., February 18, 1910.

CACAO—Caracas, 11¾c. to 12¼c.; Grenada, 11½c. to 11¾c.; Trinidad, 11½c. to 12c.; Jamaica, 9¾c. to 10½c. per lb.
COCOA-NUTS—Jamaica, select, $27·00 to $28·00; culls, $17·00 to $18·00; Trinidad, select, $25·00 to $26·00; culls, $16·00 to $17·00 per M.
COFFEE—Jamaica, ordinary, 9c. to 9½c.; good ordinary, 9½c. to 10c.; and washed, up to 11½c. per lb.
GINGER—9¼c. to 13c. per lb.
GOAT SKINS—Jamaica, no quotations; Barbados, 49c. to 50c.; St. Thomas, St. Croix, St. Kitts, 47c. to 49c. per lb.; Antigua, 49c. to 50c., dry flint.
GRAPE FRUIT—$3·00 to $4·00 per box.
LIMES—$5·00 to $5·50 per barrel.
MACE—32c. to 36c. per lb.
NUTMEGS—110's, 8⅜c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4¼c. to 4⅜c. per lb.
SUGAR—Centrifugals, 96°, 4·20c. per lb.; Muscovados, 89°, 3·70c.; Molasses, 89°, 3·45c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., March 5, 1910.

CACAO—Venezuelan, $12·40 per fanega; Trinidad, $11·90 to $12·15.
COCOA-NUT OIL—88c. per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$4·40 per 2-bushel bag.
ONIONS—$3·75 per 100 lb.
PEAS, SPLIT—$6·75 to $7·00 per bag.
POTATOS—English, $1·00 to $1·50 per 100 lb.
RICE—Yellow, $4·80 to $4·90; White, $5·00 to $5·10 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., March 15, 1910; Messrs. T. S. GARRAWAY & Co., March 15, 1910.

ARROWROOT—St. Vincent, $3·60 to $3·75 per 100 lb.
CACAO—$10·50 to $11·00 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb., scarce.
HAY—$1·20 per 100 lb., dull.
MANURES—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—Bunched, $2·50 to $3·50 per 100 lb.
PEAS, SPLIT—$6·20 to $6·25 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $1·80 to $2·75 per 160 lb.
RICE—Ballam, $4·33 to $4·60 (180 lb.); Patna, $3·80; Rangoon, $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, March 5, 1910; Messrs. SANDBACH, PARKER & Co., March 4, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·00 to $8·25 per 200 lb.	$8·00 to $8·25 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
CACAO—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	12c. to 13c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	14c. to 14½c. per lb.	14½c. to 14¾c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL—	$4·75 per bag of 168 lb.	$4·60 per bag of 168 lb.
Green Dhal	None	——
EDDOS—	$2·40 per barrel	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	No quotation
Madeira	4c. per lb.	No quotation
PEAS—Split	$6·45 to $6·50 per bag (210 lb.)	$6·50 per bag (210 lb.)
Marseilles	$3·50	$3·50 to $4·25
PLANTAINS—	20c. to 60c. per bunch	—
POTATOS—Nova Scotia	$2·75	$2·60
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	$1·32 per bag	—
RICE—Ballam	No quotation	$4·75
Creole	$4·00 to $4·20	$3·80 to $4·00
TANNIAS—	$2·16 per bag	——
YAMS—White	$2·16	-
Buck	$2·16 per bag	—
SUGAR—Dark crystals	$2·65 to $2·85	None
Yellow	$3·00 to $3·25	None
White	$3·75 to $3·80	$3·60 to $3·80
Molasses	$2·00 to $2·25	none
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

A Way in Which Plants Take up Nitrogen.

IT has been long recognized that the food of both plants and animals must include bodies that contain nitrogen if they are to continue their existence. In balancing a ration for an animal, or in deciding upon the manurial treatment for a plant, the chief attention is given to those bodies, in the ration or the manure, which contain nitrogen. In order to flourish, the animal must have a sufficient supply of proteids, and the plant must be given an adequate amount of nitrogenous food.

There is, however, a difference in the complexity of the nitrogenous compounds that are supplied in the two cases. The animal derives all its energy from that which is given up when simpler substances are formed from the complex bodies that have been absorbed into its system: therefore it can only make use of compounds that have been built up already by the expenditure of energy. The plant, on the other hand, can derive its energy from an external source—the light of the sun—and it can use this energy in the formation of complex bodies from simpler ones. Subsequently, these are used for the purpose of providing energy, by their breaking down, in the inner parts of the plant, to which the light of the sun cannot penetrate, or they are absorbed by animals, for which they perform a similar function. The plant brings external energy to bear upon the task of building; the animal makes use of that energy when the structure falls.

It is a matter of common knowledge among agriculturists that plants absorb nitrogen directly through their roots, as nitrates, and that leguminous plants have an additional power to live in symbiosis with bacteria inhabiting nodules on their roots, which render the nitrogen of the air quickly available to them. Little attention has been given, in practice, to a third way in which plants take in nitrogen, namely in the form of salts of ammonia. The purpose of the present article is to draw attention to this method, and to indicate applications of it that may possibly be made in practice.

The general opinion has been, in the past, that salts of ammonia, such as ammonium sulphate, could not be absorbed directly by plants in amounts such as would be useful to them. The common idea was that all the sulphate of ammonia applied as manure must

be converted, first into nitrites and then into nitrates, by the nitrous and nitric nitrifying organisms, respectively. It has now been ascertained definitely that this is not invariably the case, for part of the sulphate of ammonia can be absorbed directly. Thus it is not correct to say absolutely that this manure is less available than nitrate of soda. It acts more slowly because that part which is used by plants is not all absorbed directly, but some of it is converted into nitrates before it is taken in by them.

A great deal of work has been done in connexion with the matter in the past, and several particular conclusions have been obtained. It has been shown that ammonium salts are absorbed as readily as nitrates, by beans and maize. Other experiments have demonstrated that ammonium salts can be utilized directly by certain grasses, and that some plants can thrive in the absence of nitrates. In the last case, however, it was not conclusively shown that the only source of nitrogen was salts of ammonia.

The most recent investigations in connexion with the subject have been conducted by Hutchinson and Miller, of the Rothamsted Experiment Station, an account of whose work appears in the *Journal of Agricultural Science*, Vol. 3, Part 2. These experimenters raised sterile seedlings from sterile seeds and grew them in various sterilized sand and water cultures. The need for the conduct of the experiment under sterile conditions is easily understood when the importance is realized of eliminating those organisms which can assist in the oxidation of ammonium salts to nitrates. The trials were made with wheat grown in sand, wheat grown in water cultures, and peas grown in water cultures. The cultures, of course, contained those substances that are necessary to the growth of plants and, in each set of experiments, differed chiefly from one another in the presence or absence of chalk, nitrifying organisms, ammonium sulphate or nitrates. The results of the experiments showed (1) that ammonium sulphate is absorbed directly by wheat and peas, (2) that, under the conditions of the experiment, peas thrive equally well whether they are supplied with ammonium salts or nitrates, (3) that wheat grows best when supplied with nitrates.

A general summary of this work will make its importance all the more evident. It shows that plants of various kinds can grow in a normal manner when ammonium salts are supplied to them under conditions which preclude the possibility of the formation of nitrates. Further, some plants grow equally well when they are supplied either with ammonium salts or nitrates, as a source of nitrogen, but a number of these appear to have a preference for nitrates.

The investigations do not make it certain that ammonium salts are ever capable of producing better results than those which are obtained from the use of nitrates. Nevertheless, there are indications that the replacement of nitrates by them may result in better yields. There are facts to show that some plants prefer ammonium salts to nitrates for early growth, but that nitrates are more suitable for their later development.

Attention has already been drawn to the power possessed by plants to build up more complex substances from simpler ones. In the case of nitrogenous bodies, an early step in the process is the formation of compounds called amides, such as asparagin. From the amides, either directly or indirectly, the complex food-substances called proteids are made, and, from the proteids, protoplasm is derived. In the present connexion, the formation of amides is the important consideration. These are more readily produced from ammonium salts than from nitrates. It often happens that plants well supplied with nitrates cease to absorb them to any great extent after a time, because of the degree to which they have accumulated in the tissues. This is not the case with ammonium salts, for these will be quickly converted into amides, and thence into proteids, after they have been absorbed. It is therefore to be expected that plants fed on ammonium salts will contain a distinctly higher percentage of nitrogen than those supplied with nitrates, and the work of Hutchinson and Miller shows this to be actually the case. The fact is also of interest that, as has been stated above, many plants prefer ammonium salts to nitrates when they are young. It would seem that the reason for this, again, is the circumstance that amides, and therefore proteids, are formed more easily from ammonium salts than from nitrates, so that, with the former bodies, the nutrition of the young plant is carried on in a more speedy and efficient manner.

A similar explanation would seem to be capable of application to the question as to why leguminous plants usually contain a higher percentage of nitrogen than plants of other kinds. The nitrogen that is handed on to them from the air by the bacteria in their root nodules is probably in a state of combination such that amides and proteids are easily formed. In any case, the conclusion of value is that the efficiency of the assimilation of nitrogen by plants in general may be increased by employing ammonium salts as well as nitrates, when it is desired to add to their nitrogenous food.

It is too early to indicate very definitely the practical application of the facts that have been demonstrated. The following general, tentative conclusions, however, affect directly the work of the planter: (1) that the growth of young plants may be stimulated by means of freshly applied ammonium sulphate; (2) that, unless the land is very poor in nitrogen, there is little need for an interval to elapse between the application of ammonium salts to the soil and the growing of the crop, for they are immediately available, to a fair extent; (3) that ammonium salts applied after the plant is well established will do immediate good to a certain degree; (4) that where plants are required to assimilate a large amount of nitrogen, it seems likely that applications of ammonium salts, together with nitrates, would be beneficial.

METHODS OF MEASURING TREES.

The following discussion on the methods of measuring trees appeared in the *Indian Forester*, Vol. XXXV, No. 11 (November 1909). It is of more particular interest in view of the increasing attention that is being given, in the West Indies, to matters connected with forestry and rubber production:—

There are two systems ordinarily in vogue [in India and Burma] for the classification of trees; one by girth classes, and the other by diameter classes. For the former, classes of 18-inch periods are usually adopted, and for the latter, classes of 6-inch periods. Thus for girth classes, it is usual to speak of trees measuring less than 1½ feet in girth, at breast height, as V class trees; those above 1½ feet and up to 3 feet as IV class; those above 3 feet and up to 4½ feet as III class; those above 4½ feet and up to 6 feet as II class, and those above 6 feet in girth as I class. It is equally common, when reference is made to trees classified by diameter measurements, to speak of trees up to 6 inches in diameter, at breast height, as V class trees; trees above 6 inches and up to 1 foot in diameter as IV class; trees above 1 foot and up to 1½ feet as III class; trees above 1½ feet and up to 2 feet in diameter as II class; and trees above 2 feet in diameter as I class.

It thus comes about, that I class trees are loosely referred to as being either above 6 feet in girth or above 2 feet in diameter, as if these measurements were synonymous.

Again, the classes mentioned above have practically become, throughout India, standard classes of measurement, and it only remains for it to be decided whether girth classes or diameter classes are to be adopted for the future.

It is therefore, we consider, most advisable that definite standard classes should be fixed so that it will always be known what is meant by a I class tree, II class, and so on. In our opinion, girth classes are the most suitable, for the sections of trees are seldom circular, and it is a matter of some difficulty to ascertain the exact average diameter of a tree, whereas the exact girth can always be easily ascertained. By this we do not mean that all measurements of trees for marking, etc., should be done by tape. It is easy to have callipers graduated to correspond to the diameters of the 18-inches girth classes, and it is usual in practice, when using callipers, to measure each tree in two directions at right angles. We have found it quite accurate, if it is shown that a tree, measured in both directions, falls to the same, to record it as belonging to that class; but when the measurement in one direction locates a tree in one class, and in the other direction in another class; we found that the simplest way to decide the right class was by girth measurement with a tape. We recommend that the girth classes given above be now officially adopted as standard classes, so that in future, there will be no doubt as to what is meant by a I class tree, II class, and so on; and as these classes are already generally known and used, it would be simpler to adopt them than to lay down a revised scale of classes altogether.

Of course, we recognize the fact that, for many working-plans and other purposes, the standard classes would not be sufficient, as it is often necessary to discriminate between the sizes of trees above 6 feet in girth, and to differentiate in more detail between smaller trees. For the latter, subdivisons of the standard classes will generally suffice, but for all other divisions from the standard classes, we recommend the adoption of letters to indicate that the class referred to is a special one. Thus, in cases where a minimum exploitable size of above 7½ girth is adopted, the class above 7½ feet in girth might conveniently be termed M class, meaning mature, or by any other appropriate letter. Any officer coming across the mention of an M class tree for the first time, would at once enquire what it meant, and no confusion would arise.

The question as to the height at which the girth measurements should be taken is more complicated, for on account of some species developing large buttresses, they cannot be measured at the usual breast height, which is generally taken to be 4½ feet above the ground. For practical purposes, it will probably be sufficient for the girths to be taken as they are now at breast height, where there are no buttresses, and as near above that as the buttresses will allow, if there are no buttresses, except when the buttressed portion is utilized, in which case a correcting factor might possibly be adopted. This matter is one on which some enquiry is necessary before standard rules can be decided on.

The Cause of the Germination of Seeds.

It is a matter of common observation that a stage exists, in all vegetable life, when the vital activities seem to be suspended. In most of the plants with which there is a common familiarity, this stage belongs to the seed. There is a period of dormancy, followed by what is called germination.

This period probably had its origin in the necessity for the provision of a form of protection during a time when the plant was surrounded by untoward conditions, as in winter. or in the dry season. The end of the resting period, as it may be called, came when those conditions were succeeded by others which were favourable. There is the additional consideration that time and opportunity had also been afforded for the wide separation of the embryo plant from its parent, or parents; provision was made for the distribution of the species.

These matters naturally lead to the question which asks what it is within the seed that causes an awakening of life to take advantage of the favourable conditions that occur once again. The answer given by the most careful investigations that have been undertaken up to the present is, that the cause is provided by the ability of the protoplasm in the seed to respond to its surroundings.

WEST INDIAN FRUIT.

SHIELD BUDDING FOR THE MANGO.

In Bulletin No. 20 of the Hawaiian Agricultural Experiment Station, an account is given of the means by which shield budding may be employed in the case of the mango, and the advantages of the method suggest that it is worthy of trial in the West Indies. An illustrated account of the propagation of the mango by patch budding was given in the *Agricultural News*, Vol. III, p. 283. In order to facilitate experiments in shield budding by those who are interested in the subject, the following information has been taken from the bulletin to which reference is made:—

The proposed method is new only in its modifications and in its application to the mango. It is merely shield budding with an inverted T adapted to the peculiarities of the mango. Shield budding is probably one of the oldest, and certainly the most widely practised, of all methods of budding. Ordinary shield budding had been tried on the mango long ago, following the general practice in the selection of bud-wood and stock that governs in the shield budding of citrus fruits, peach, or plum. In this case young bud-wood was used with the leaf still attached, and it was inserted in young wood. It soon became apparent, however, that this method would not work successfully, and it was abandoned, giving place to the patch bud, which was practised with more mature bud-wood and stock. The present method consists in using wood of the same maturity as in patch budding, but adopts the similar device for bringing the bud shield into contact with the stock, and may be known as shield budding with an inverted T incision.

THE STOCK. Budding by this method has been successfully performed on stocks from an inch to 3 inches in diameter. What the limitations are, on either side of these dimensions, is not known at present. Wood of this size, in seedling trees, may be from two to five years old. It is essential that the stocks be in a thrifty condition and, still more important, that they should be in 'flush'. If not in this condition, the bark will not readily separate from the stock. It has been found that the best time is when the terminal buds are just opening. Unless the trees are watched carefully, they will pass this stage before the flush is observed. When the young, brown leaves have appeared, it is often too late to bud, and the operation must be postponed until the next flush.

THE BUD-WOOD. The bud-wood which has been most successfully used is that which has lost most of its leaves, and is turning brown or grey in colour. Such wood is usually about an inch in diameter. It is not necessary in this method of budding that the bud-wood should be in a flushing condition, although it may be an advantage to have it so. It should, however, be healthy wood of normal growth.

PREPARATION OF THE STOCK. The incisions should be made in the stock about 6 inches in length. At the lower end of this make an incision at right angles to it, with the knife edge pointing upwards at an angle of about 45 degrees with the stock, thus making a curved incision. Insert the sharpened end of the handle of the budding-knife beneath the bark at the junction of these incisions, and push it gently upward, raising the bark so as to make a place for the bud. It is not necessary to push the handle far, but, by gently prying, the bark may be separated from the stock, if the latter is in proper condition, without injuring the delicate cells against which the bud shield is to be placed.

PREPARATION OF THE BUD-WOOD. The bud is now to be removed from the bud-wood. With a rather heavier knife than is generally used for budding, in the right hand, and the bud-wood held firmly in the left, place the blade against the bud-wood with a very slight inclination, and cut so as to make as flat a surface as possible under the bud shield. This bud shield should be about 3 to 3½ inches long, with the bud in the centre. The small portion of wood, which will thus be taken off with the bud shield, may be removed if it slips readily. If not, it should be left in place. The lower end of the shield is then taken between the thumb and finger, and gently inserted in the incision prepared for it, pushing it up until it is held firmly in place by the surrounding bark.

TYING AND WRAPPING. The stock must then be tied with raffia or some other soft, but strong, tying material, so as to prevent drying out. The cut surfaces below the actual bud are usually covered with grafting wax, and the whole is then wrapped with a waxed cotton bandage, beginning at the lower part and winding spirally to the top, exposing only the actual bud. This method of wrapping protects the bud and the wound from the access of water. The bud is shaded by a short piece of bandage hung over it and held in place by being laid under the upper strands of the spirally wound bandage.

SUBSEQUENT TREATMENT. In about three or four weeks, if the bud remains green, the stock should be lopped at a point about 7 inches above the bud. Care should be taken, in thus cutting the stock partly off, to avoid splitting downward. It should be made to split upward into that portion of the stock which is to be destroyed. This lopping will serve to force the bud into growth. Many other buds, on the sides of the stock, will start into growth before the new one. These must all be cut off. It has not been found necessary to remove the tying and wrapping material until

the bud has made two flushes, and often it is not necessary at all, since the raffia usually decays beneath the waxed cloth, and the latter naturally expands with the growth of the stock. When the bud has started into growth, the top of the tree may be completely cut off and destroyed. The stump remaining above the bud may be cut off with a sloping cut close to the bud, after the latter has made three or four flushes.

ADVANTAGES OF THE METHOD. It has been found that buds can be set quite rapidly by this method. In the experience of the writer, five or six buds could be set, by this means, to one by the patch bud method. Speed may be increased also by the use of unskilled labour in the tying and binding operations. The operator can set the bud and pass on to the next without any danger of its getting out of place before the helper, who immediately follows, ties it.

Perhaps the most important advantage in this method of budding lies in the fact that it may be used successfully when the bud-wood is not in an active growing condition. The most tedious part of patch budding is in removing the bud, and frequently in doing so it will be broken. Further, it is often impossible to get bud-wood of a desired variety in active condition when the stocks are ready to be operated upon.

The method may be applied most advantageously to seedling trees in orchard form when they have become large enough to be operated upon, when the buds should be set only a few inches above the ground. It may also be used in top-working old trees to new varieties.

WHY PLANTS ARE GREEN.

An endeavour has been made recently by Professor Stahl to account for the fact that the higher, as well as many of the lower, plants are green. It is well known that the green colour of such plants is due to the possession by them of a colouring matter called chlorophyll, and the object of the enquiry has been to find out why this should possess that colour rather than any other. Starting from the fact that ordinary white light is composed of the primary colours—red, orange, yellow, green, blue, indigo and violet—that is the colours of the spectrum, it is easy to understand that chlorophyll owes its greenness to the fact that it absorbs much of the light at the red and blue ends of the spectrum, and rejects the green. This absorption of the red and blue rays can be simply demonstrated by allowing light of either of those colours to fall on the green parts of a plant, when they appear almost black.

The light that is absorbed by a green plant is, of course, used as the source of energy by means of which it builds up the more complex compounds, required in its life-processes, from simple ones. For this purpose, the red and orange rays are used chiefly. The work of Stahl and other investigators shows that the energy from the blue end of the spectrum is also employed in the same way. All these useful rays would be absorbed equally well if the leaves were black or grey. Why is it, then, that they are green? In other words, why is it that the trouble is taken to exclude most of those rays from the leaf that are not required to enable it to carry on its work?

In order to assist in obtaining an answer to this question, reference is made to the seaweeds. The red seaweeds contain a red colouring matter which surrounds, and gives rise to, the green colouring matter (chlorophyll) that is present in their cells. It may be proved that they possess chlorophyll by placing them in hot water, when they become green. A question immediately arises as to why such seaweeds possess a red, as well as a green, colouring matter. It is solved by reference to the fact that these plants usually live in deep water. The colour of water is blue, that is to say, if white light passes through a sufficient depth of it, only the blue rays will remain unabsorbed. The result of this is to cause the light which reaches a plant of red seaweed, growing in its usual habitat, to contain a very small proportion of the orange and red rays. These are, however, the very rays that are absorbed by the chlorophyll for the purpose of providing energy in order that food may be manufactured for the uses of the plant, and the fact of the small amount of these kinds of light makes it expedient that means shall be provided by which the rays that are present in greater proportion shall be utilized in this manufacture. This is where the use of the red pigment is found. It absorbs some of the blue and green light, and thus provides additional energy for the needs of the plant. Such absorption is rendered possible by the fact that the colour of this pigment (red) is complementary to that of the surrounding water (blue).

The application of these facts has now to be made to chlorophyll in plants which live under ordinary, atmospheric conditions. Chlorophyll actually consists of two pigments—a blue-green one, which absorbs specially red and orange rays, and a yellow-orange pigment, which acts in the same way toward blue rays. The light which reaches a plant is of two kinds: that which falls upon it directly from the sun, and that which only reaches it after reflection from surrounding bodies—diffused light. In the former, the red and orange rays are present in the greatest proportion; in diffused light, they are not found to the same extent, and there is more blue light. But from what has just been said, these are absorbed by the blue-green and the orange-red pigment, respectively. Thus the presence of the first-named pigment is to enable the plant to take advantage of direct sunlight, and of the orange-red pigment to enable it to make the best use of diffused sunlight.

The colour of leaves, then, is not black or grey, even though in this case they would absorb the largest amount of energy for the purpose that they have to fulfil in the economy of the plant. The reason is that, with such colours, the amount of light absorbed would be sufficiently large to cause injury to the protoplasm that they contain. They are green because they contain pigments that enable the right kinds and quantity of light to be absorbed, whether this is received directly from the sun or after reflection from surrounding objects.

Yield of Copra from Cocoa-nuts.

An account of trials that were carried out at the Experiment Station, Peradeniya, Ceylon, in order to find out what percentage of copra could be obtained from cocoa-nuts is given in the *Tropical Agriculturist* for January 1910. The nuts employed were generally small, and, for the purpose of the investigation, 10,000 of them were taken. The results of the experiments were as follows:—

	lb.	per cent.
Weight of nuts ...	1,284·5	(100·0)
,, water in nuts ...	163·5	12·7
,, shells ...	376·5	28·6
,, kernels ...	753·5	58·7

From the kernels, the weight of dry copra obtained was 337·5 lb.; that is to say, the kernels yielded 44·8 per cent. of their weight in copra. In the same way, the weight of the dry copra was 26·3 per cent. of that of the nuts.

This is expressed differently by saying that 1 ton of cocoa-nuts may be expected to yield 1,315 lb. of kernels, from which 589 lb. of copra will be obtained.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 14, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, a good business has been done in West Indian Sea Island cotton, and about 800 bags have been sold at about 1*d.* per ℔. advance.

The sales include St. Vincent 19*d.* to 23½*d.*, St. Lucia 19*d.*, St. Kitts 18*d.* to 20*d.*, St. Croix 18*d.* to 20½*d.*, Nevis 19*d.* to 20*d.*, Montserrat 17*d.* to 19*d.*, Barbados 18*d.* to 21*d.*, and Anguilla 19*d.* to 20½*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 11, is as follows:—

There continues a good demand for the planters' crop lots, resulting in sales of about 250 bales at 40c. to 50c., the buying being for export. The unsold stock now is reduced to about 500 to 600 bales, consisting very largely of planters' crop lots held at 45c. to 50c., and for which there is a demand, but at prices somewhat below the views of the factors. However, the present outlook is that the entire unsold stock will be disposed of very soon.

BRITISH COTTON-GROWING.

The following information was given, at a recent general meeting of the British Cotton Growing Association, in regard to cotton-growing in the British Empire :—

WEST AFRICA. The purchases of cotton in Lagos for the year 1909 amount to 12,065 bales, as compared with 5,410 bales for 1908, and 8,456 bales for 1907. The quality of the cotton has greatly improved, and there has recently been a brisk demand for West African cotton, and all last year's crop has now been disposed of. The new crop, which should commence to come in about the middle of January, is apparently late this year, but the first shipments are expected to reach Liverpool early in March.

UGANDA. Arrangements are being made by which seed-cotton is to be selected by the Superintendent of Agriculture at the ginneries, and ginned separately, and the seed so selected to be returned to the Cotton Department for planting purposes. It is pointed out that, owing to the changeable climate in Uganda, and the fact that many producers are still most ignorant of the proper methods of picking and handling cotton, it is impossible to prevent a certain amount of inferior cotton coming into market, but it would be unwise to prohibit the sale of seed-cotton, which has probably been brought from a considerable distance, and represents the best which the native is at present capable of growing. The Government officials are of opinion that it will be at least two years before the results of the present efforts will show in the quality of the cotton. It was considered that a great deal of credit was due to the Agricultural Department for the efforts now being made to improve the quality of the cotton.

NYASSALAND. Letters were read from various planters stating that the results during the past season have been most satisfactory, and very good prices are being realized for the cotton. The lack of adequate ocean transport facilities has been a great drawback to the development of the cotton-growing industry, both in Nyassaland and in Uganda, and great satisfaction was expressed that arrangements have now been made for the Union Castle Line of steamers to run a monthly service round the Cape to Mombassa, serving all the East African ports on the way. This service should be a very great help in assisting the development of cotton growing.

RHODESIA. It was reported that, in co-operation with the British South Africa Company, the Association has sent out an Agricultural Expert to Northern Rhodesia, to ascertain the possibilities of the country for cotton growing.

The President mentioned that the Chairman of the British South Africa Company was most favourably inclined towards cotton cultivation in Rhodesia, and was in that country at the present time on a visit of inspection, and was going to make enquiries on the spot as to the possibilities of a large and immediate development of cotton-growing there.

THE PRODUCTION AND CONSUMPTION OF COTTON.

At a recent meeting of the shareholders of the Manchester Ship Canal Company, the Chairman (Mr. Bythell) gave some interesting figures as to the world's production of cotton and its requirements. The immense expansion of the area under cotton cultivation in the United States during the last forty years is not generally recognized. In 1874-5, there was a crop of 3,833,000 bales, and the average price of the standard quality of middling American at Liverpool was 7·67*d.* Ten years later, the season's crop was 5,669,000 bales, and the price 5·76*d.*,—an increase in production of 47·9 per cent., and a decrease in price of 24·9 per cent. Ten years later again, the crop was 9,893,000 bales,

and the price had fallen to 3·41*d.*,—an increase in production of 74·5 per cent., with the price 40·8 per cent. lower. Production had then apparently, for the time being, overtaken the consuming power. In 1904-5, the season's crop was 13,557,000 bales, and the price 4·93*d.* As compared with 1894-5 there had been an increase of 37·03 in production, but the price was 44·6 per cent. higher. The great increase in the world's spindles is shown in the following figures: 1870, 58 millions; 1881, 75 millions; 1885, 81 millons; 1895, 94 million; 1905, 113 millions; 1909, 129 millions. This year, it is to be feared, the American crop will not exceed 11 million bales, and may well be less. (The *Journal of the Royal Society of Arts*, February 25, 1910.)

METHODS FOR GETTING RID OF MISTLETOE.

A short note on the mistletoes of the West Indies appeared in the *Agricultural News*, Vol. VIII, p. 345, and a means of getting rid of this pest was indicated in a general way. In Bulletin No. 166 of the United States Department of Agriculture, entitled *The Mistletoe Pest in the South West*, the subject is dealt with in a thorough manner. Much of the information that is given does not go beyond the usual methods that are employed for the eradication of mistletoe, but several interesting facts are brought forward which render the contents of the bulletin worthy of notice.

Where small branches are infested, the pest will be effectually removed by the careful cutting away of these at a few inches below the place where the parasite is attacking. The difficulty that presents itself, in employing this method, is that of reaching the higher branches. This may be overcome by the employment of that form of pruning shears in which the instrument for cutting is attached to the end of a long pole and worked from below by means of a strong cord. It is important that, however the cutting may be effected, it should be done cleanly; there should be nothing in the nature of tearing or breaking of the branches.

In cases where the infestation has taken place more largely, a great deal may be done toward keeping the mistletoe under control by continually removing the sprouts at fairly frequent intervals. The removal of the mistletoe may be effected by the employment of a hook at the end of a pole, by means of which it is broken from the branches. The work will be more efficient if a pruning hook is used instead of an ordinary one, as by means of this, the parasite can be cut off close to the surface of the branch on which it is growing, so that many of the undeveloped buds will be destroyed. This method of treatment has an advantage in that it reduces the chances for fruits and seeds to be formed, and so lessens the extent to which the pest may be disseminated. The best time for the removal of the mistletoe in this manner will be naturally during the period of the year when the rainfall is lowest, that is when the number of leaves on the tree gives the greatest chance for the parasite to be seen. Care would be required in order that the bark of the tree may be wounded as little as possible by the hook, and where this had been done the injured surface would have to be coated with tar.

An account is given, in the bulletin mentioned, of attempts that were made to prevent the re-appearance of the mistletoe after it had been cut from deeply infested branches. In each case, the mistletoe was shaved off close to the bark, and large branches were smeared or painted with: (1) a strong wood preservative called carbolineum, (2) asphalt paint, (3) laundry soap. In each case, part of the treated surface was wrapped closely in coarse canvas, while the other part was left unwrapped. The results were as follows:—

Substance used.	Appearance of Mistletoe. On wrapped part.	On unwrapped part.
Carbolineum	None	None
Asphalt paint	In following season	None, while wrapped
Laundry soap	Not delayed	,, ,,

No injury to the branches resulted from the treatment. It would thus appear that applications of a strong preservative like carbolineum will kill mistletoe, without injuring the branch on which it grows, and that milder preparations, such as asphalt paint, coal tar and white lead, may be used for the purpose of checking the development of young mistletoe shoots, while, by the additional precaution of wrapping the branch, the parasite may be ultimately killed.

The removal of large areas of tissue, in the case of much infested branches, is also dealt with. It is suggested that, wherever wounds of any kind have been made for the purpose of removing mistletoe, the cut surfaces should be treated with a solution consisting of 1 part of corrosive sublimate in 1,000 parts of water (that is to say, 1 oz. of corrosive sublimate in 7 gallons of water, as is used for disinfecting cotton seed), or with one containing 1 lb. of copper sulphate in 5 gallons of water, before the protective dressing is applied.

RATES OF GROWTH OF RUBBER PLANTS.

In the *Annual Administration Report* (1908-9) of the Government Botanic Gardens and Parks, the Nilgiris (Government of Madras), particulars of the rate of growth of various plants are given. Among these are statistics, relating to the growth of various rubber trees, in the Botanic Garden at Kuller, of which a part is extracted below. In the report itself, particulars for six dates are presented, but only three of these have been taken—those for the beginning, the middle (approximately) and the end of the period of observation. In the following table, figures are given for the height (a), the girth at 1 foot from the ground (b), and the girth at 4 feet from the ground (c):—

MEASUREMENTS.

Kind.		May 6, 1904. feet	inches	March 26, 1907. feet	inches	May 4, 1909. feet	inches
Average Ceara	a	21	10	32	0	38	11
	b	1	6	2	10½	3	9¾
	c	1	3¾	2	6¾	3	5
Para (from small seed)	a	14	2	41	0	47	0
	b	0	5¼	1	11	2	10
	c	0	3½	1	5½	2	3
Para (from large seed)	a	22	4	37	0	44	11
	b	0	7¼	1	8	2	6½
	c	0	5¼	1	4½	2	3
Para (typical)	a	16	6	35	0	40	4
	b	0	6¼	1	5	2	2½
	c	0	4¾	1	1	1	7
Para (good latex-yielding)	a	18	0	33	3	41	1
	b	0	6½	1	2½	1	11
	c	0	5	0	11½	1	6
Assam (Rambong)	a	12	0	25	0	33	6
	b	...		1	10½	4	0
	c	...		2	3	2	10
West African	a	13	6	28	4*	36	10
	b	1	2	1	5	2	1½
	c	0	5½	1	3¼	1	11

* Top injured

EDITORIAL NOTICES.

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Agricultural News

Vol. IX. SATURDAY, APRIL 2, 1910. No. 207.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of the present number reviews recent work that has been done in connexion with the direct absorption of sulphate of ammonia by green plants, and deals with the practical bearing of the matter.

Some suggestions for the adoption of uniform methods for measuring trees are given on page 99.

Special attention is drawn to the account, on page 100, of a way in which shield budding may be utilized in the case of the mango. A note on a method of propagating this plant also occurs on page 104.

An account of the most recent views as to why plants are green is given on page 101.

The Insect Notes, on page 106, are written with the object of ending some of the confusion that exists in relation to the kind of insects to which the common name 'lady-bird' is applicable.

Interesting information in connexion with the fertilizing influence of sunlight on soils is given on page 107. The article should be read in connexion with the editorials of the issues of the *Agricultural News* dated January 22, and February 5, 1910.

The third part of the series of articles that are being given under the heading Fungus Notes, entitled The Chief Groups of Fungi, appears on page 110. In this, Fig. 17 is reproduced after Hartig, Fig. 18 after Sachs, and Fig. 19 after de Bary.

A Method of Propagating Mangos.

In connexion with an article which appears in this number of the *Agricultural News*, on shield budding for the mango, it is worthy of note that an account of another method for the propagation of this plant appears in the *Porto Rico Horticultural News* for February last. It consists in preparing one year old branches the mango in the way that this is done for the same purpose in the case of carnations; that is, a tongue 3 inches in length is cut in the wood, and a small stone is inserted in order to keep the tongue away from the branch. All that remains to be done after this is to bury the cut part of the branch in soil, in a bamboo pot, which is kept watered. In experiments conducted by the writer, after ninety-six days, two out of six branches had formed roots and were cut from the parent plant. It is stated that a claim is made to the effect that trees propagated by this method yield fruit more quickly than by any other.

Two Mexican Vegetable Waxes.

In *Tropical Life* for February 1910, two vegetable waxes from Mexico are described by Dr. P. Olsson-Seffer. The first of these is known as Jalapa Myrtle Wax, and is derived from *Myrica jalapensis*; in Mexico, the tree which produces the wax is called Arbol de la Cera. It is used chiefly and extensively for the manufacture of wax candles; these burn slowly, give little smoke and emit an agreeable balsamic odour, but do not give a very strong light. In addition to being employed in making candles, the wax is used as a medicine. The crude product, as usually prepared, is green or almost black in colour, and more brittle than beeswax, is obtained from the fruit by extraction with boiling water. It is intended to employ it commercially for making candles and soap.

The second product of a similar nature is known as Candelilla Wax, and is derived from the candelilla plant (*Euphorbia anti-syphilitica*), which often grows together with the Guayule rubber plant (*Parthenium argentatum*), but occurs in much larger quantities. It has been used for some time by the Indians of Northern Mexico for candle-making, but has obtained more general industrial importance recently. The crude wax is greyish in colour, owing to the large amount of clay that is mixed with it. This clay is derived from the fine dust that generally covers desert plants. It resembles closely the Carnauba, or Ceara, wax of commerce (from the palm *Copernicia cerifera*). The wax is obtained from the dried plant by boiling it in water, or by steaming.

Among the commercial uses that candelilla wax appears to possess are: the manufacture of candles (in conjunction with commercial stearic acid and paraffin); as an ingredient of ointments, pills, and other pharmaceutical products; for making phonograph records; as an insulating agent in connexion with electrical work. It has been tried experimentally, with success, in shoe polishes, floor polishes, wax varnishes, lubricants, leather-dressing and waterproofing materials. In short, it may be said that, generally speaking, it is a good substitute for carnauba wax.

Bees and Foul Brood.

An interesting correspondence between the Board of Management of the Jamaica Agricultural Society and Messrs. A. I. Root of Indiana, U.S.A., as to the possibility of the introduction of foul brood into the West Indies through the importation of queen bees from the United States, is given in the *Journal of the Jamaica Agricultural Society* for February 1910. It is stated, on behalf of the firm mentioned, that there is no likelihood of such infection being carried by a queen bee, even if this was obtained from a badly infected colony. It has never been shown that either European or American foul brood has been communicated through the queen bee. A precaution to be observed in connexion with such importation is advised, however. This consists in re-caging the bee, immediately on its delivery, with fresh food and a new escort. The reason why this precaution is recommended is that foul brood may be carried in the food in the queen-cage, as the germs of the disease will live in the honey.

In consequence of this, it was resolved by the Board of Management to ask the Government of Jamaica to prohibit the importation of bees, used hives or used combs, an exception being made, in the case of the first, to the effect that importation of queen bees may be permitted on condition that the importer intimates previously his desire to effect this to the Director of Agriculture, to whom the imported queens should be addressed, and who would destroy the old escort and food, and provide fresh supplies of these.

'Bichet' on Cacao.

A sample of the growth on cacao known as 'bichet', in Grenada; has been received from Mr. G. G. Auchinleck, B.Sc., Agricultural Superintendent in that island. In forwarding this, Mr. Auchinleck states that it may be described as the result of the rapid subdivision of the roots of cacao near the surface, under a leaf mulch, so that the minute rootlets seize upon partly decayed leaves, twigs, etc., and give rise to a mass of inter-tangled fibres.

The name 'bichet' is employed in the patois of the island for the growth, and is probably derived from a similar dialect word meaning 'sieve', owing to the rough resemblance of the structure to the meshes of a sieve.

The development of bichet is looked upon as a proof of lack of care, for it only occurs where a mulch lies undisturbed for long periods. The growth is healthy, as it indicates that food is being rapidly absorbed by the plant from which it springs. Any advantage in this direction appears, however, to be outweighed by the fact that, during drought, the very possession of it by a tree results in markedly bad effects.

Mr. Auchinleck states, further, that the growths of bichet are usually cut away deliberately, in view of the harm that they are supposed to effect. The subject is of interest, in view of the success that has been obtained in Dominica by actually applying mulches of grass and leaves to cacao, and it would be valuable to know if there is any connexion between the roots in bichet and the useful roots that are developed more deeply when mulching of the kind practised in Dominica is employed.

Demonstrations at Agricultural Shows.

Attention was drawn, in the last number of the *Agricultural News*, to information in connexion with agricultural education contained in the *Report on the Operations of the Department of Agriculture, Eastern Bengal and Assam*, for the year ending June 30, 1909. An additional interesting feature of this report is the accounts of agricultural shows that were held with the assistance of that Department. At these, an important part of the proceedings seems to have been demonstrations with various agricultural implements and machines, new to the district, such as maize crushers, maize shellers, wheel hoes and spraying machines. These were shown at work on the show ground, and attracted the attention of a large number of peasant cultivators. For the purpose of demonstrating the methods of spraying Bordeaux mixture, a crop of potatos had been planted on the show ground some time before the show itself was held.

It would seem that similar demonstrations might profitably take a larger place than they occupy, at present, at agricultural shows held in the West Indies.

Vanilla in the Seychelles.

Information concerning the markets for vanilla was given recently in the *Agricultural News* (Vol. IX, p. 52). Additional facts are contained in the *Bulletin of the Imperial Institute*, Vol. VII, No. 4, with especial reference to the state of the vanilla-growing industry in the Seychelles. According to this, the crop of the spice in 1908 amounted to 24·75 tons, as against 66·5 tons in 1907, the cause of the decline being the weakening of the plants after the heavy yield of the preceding season. The best of the Seychelles vanilla is said to be sold in France: the reason for this is that the market for the finer kinds is better there than in the United Kingdom. The price of vanilla does not show any improvement, as artificial vanillin continues to compete with it more severely than ever. For this reason, experiments in manuring, etc., have been instituted in recent years, in order to find means of lowering the cost of production. So far, the results have shown that the application of ground limestone, or of nitrate of soda, gives an increase in the yield of pods, and that the latter manure tends to prolong the period during which the plants are in bearing. Plants grown in a mixture of fern roots and soil gave better returns than those planted in ordinary soil, probably because the roots of the ferns are rich in lime. It has been found advantageous to grow the plants under shade.

Manurial experiments and analyses of the ash of the plants have shown that the most important manurial constituents for vanilla are lime, soda and phosphates; potash and magnesia are less important. Investigations as to the effect of each of these constituents are now being made.

INSECT NOTES.

LADY-BIRDS AND WEEVIL BORERS.

The lady-birds and weevils belong to two groups of the beetles, or Coleoptera: the lady-birds to the family Coccinellidae, and the weevils to the sub-order Rhyncophora. They are very distinct in appearance, as well as in habit, and the members of one group can easily be told from those of the other.

The weevils (Rhyncophora) have the head prolonged into a beak or snout, and from this peculiar structure they have been called the snout beetles or bill-bugs. In the case of some of the weevils, the snout is long and slender, and in others short and broad. In all cases the mandibles are situated at the tip of the beak. The lady-birds (Coccinellidae) are generally rather hemispherical in shape, the wing-covers being much curved and rounded; the head is very small, and the thorax is much smaller than the abdomen, though larger than the head.

Fig. 13 shows two lady-birds, (a) the spotted lady-bird, *Megilla maculata*, and (b) the red lady-bird, *Cycloneda sanguinea*. *Megilla maculata* is slightly elongated, pinkish red in colour, with black spots, and rather flat. The red lady-bird is much more hemispherical; the small head and thorax are black, the thorax with a whitish marking; the arched and rounded wing-covers are blood-red.

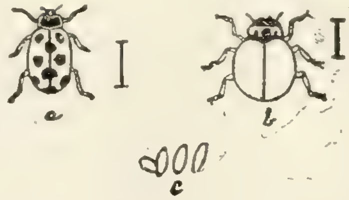

Fig. 13. (a) *Megilla maculata*. (b) *Cycloneda sanguinea*. (c) Eggs of Lady-bird.

These are common insects in the West Indies, and ought to be well known to every agriculturist. They are often to be found in fields of cotton, corn and potatos, and sometimes in cane-fields. They also occur in lime trees, pigeon peas and, in fact, on any trees or plants infested by plant lice, scales and similar insects. These

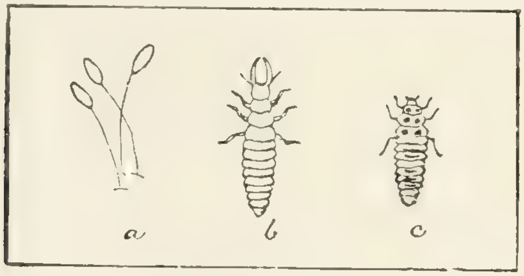

Fig. 14. Lace Wing and Lady-bird. (a) Eggs, (b) Larva of Lace Wing; (c) Larva of Lady-bird.

two lady-birds are not active enemies of scale insects, although they feed upon them to some extent. The most energetic lady-bird enemies of scale insects are very small. There will often be found, on scale-infested limes and guavas, dark blue, brownish, or blackish lady-birds about the size of a pin's head. These are very active, and if watched carefully, may be seen to capture and devour the young of scale insects, and even to force their way under the scale-covering of the adult in order to get at the insect itself. The larva of a lady-bird is shown at Fig. 14 (c), and the eggs are represented at Fig. 13 (c).

Fig. 16. Root Borer. (*Diaprepes abbreviatus*.)

The family Coccinellidae includes, with very few exceptions, beneficial insects. Their habit of feeding exclusively on the worst kinds of insect pests—scale insects and plant lice—renders them worthy of notice on the part of the agriculturist, and he should distinguish them at sight from all other insects. There are several species found commonly in the West Indies, and in every country there are indigenous ones which prey on the native forms of scales and plant lice, generally keeping them in check, except for occasional outbreaks. An interesting and valuable example of this is to be found in the case of an Australian scale insect and its associated lady-bird. The scale insect—the fluted scale (*Icerya purchasi*)—was introduced into California about 1865. By the year 1886, it had become a most serious pest of oranges. In 1889, the natural lady-bird enemy (*Novius cardinalis*) of this scale was imported from Australia into California; in a very short time it brought the fluted scale under complete control, and for a number of years has prevented the scale from developing in sufficient numbers to become a serious pest.

The weevils (Rhyncophora) are very different in structure and in habit from the Coccinellidae. They are all plant feeders, and some of them are among the worst enemies of cultivated plants.

Two serious pests belonging to this group are borers of sugar-cane—the root borer (*Diaprepes abbreviatus*—*Agricultural News*, Vol. IX, p. 58, Fig. 7) and the weevil borer (*Sphenophorus sericeus*—*Agricultural News*, Vol. IX, p. 58, Fig. 6). The larva of the former of these lives in the underground portion of the cane, while that of the latter is found in the stem above ground. In the West Indies, the mistake is made of calling one or both of these pests 'lady-birds'. This leads to great misunderstanding, for only the beneficial insects of the family Coccinellidae should be known as ladybirds. In all other parts of the world where English is spoken, this is the custom; and it is convenient to be able to make use of the term in accordance with general usage. It has happened, before now, that articles which have appeared in the *Agricultural News* have been misunderstood by readers in the West Indies, because they have thought that the word 'lady-bird' was used in connexion with insects that they know to be injurious.

Fig. 15. Weevil Borer of Sugar-cane.

Every reader of the *Agricultural News* ought to make an effort never to apply the name lady-bird to any insect except those which, as has been already explained, have the habit of feeding on other insects. At the same time it will be of great value if all the insects which have the front of the head prolonged into a snout or beak could be spoken of, and thought of, as weevils, and the term weevil could always be made to mean a serious, or at least troublesome, pest.

Two weevils of ordinary occurrence in these islands have already been mentioned and are figured on this page. The granary and rice weevils, which infest stored grains and food stuffs, figured in the *Agricultural News*, Vol. IX, p. 26, Figs. 4 (a) and (d), are also of common occurrence in the West Indies.

The fiddler beetle (*Praepodes vittatus*) is a weevil, the larva of which is a serious pest of orange trees in Jamaica, where it attacks the roots and causes the death of the tree. The orange root grub of Porto Rico is *Diaprepes*

spengleri, also a serious pest. The shot borer of the cane (*Xyleborus perforans*) also belongs to this group.

In the United States, the Mexican cotton boll weevil occurs as the greatest enemy of cotton that is known, and it may perhaps rank as the most serious pest ever known to Agriculture.

A sufficient number of examples has been given to show that all weevils are undesirable insects. It is hoped that readers of the *Agricultural News* will realize the importance of distinguishing between the injurious and the beneficial insects mentioned.

THE FERTILIZING INFLUENCE OF SUNLIGHT.

The following extracts are taken from a letter in *Nature*, of February 17, 1910, signed by A. Howard (Imperial Economic Botanist, India; sometime Mycologist to the Imperial Department of Agriculture for the West Indies). They are of special interest in relation to the articles that appeared recently in the *Agricultural News*, Vol. IX, Nos. 202 and 203, entitled 'The Balance of Life in the Soil':—

The past history of agricultural science furnishes several examples of belated explanations of the utility of practices, the value of which has long become a tradition among practical men. The explanation of the value of leguminous crops in agriculture is a good example. While the recognition of the *rôle* of these crops in increasing the nitrogen-supply in the soil has done much to improve agriculture in new countries, it has only served to provide a scientific approval of the cultural practices of ancient civilizations, such as that of India, where from time immemorial it has been the custom to grow leguminous crops in the rotation, and also as one of the constituents of the mixed crops cultivated in many parts of the country.

Agricultural science has recently provided another explanation of an ancient Indian practice. In the *Journal of Agricultural Science* of October last, Drs. Russell and Hutchinson have found that partial sterilization of the soil by heating, or by poisons, leads to an increase in the supply of nitrogenous compounds and to increased fertility. These investigators state that partial sterilization of the soil kills off the phagocytes which live on bacteria, and also large organisms inimical in other ways to bacteria. At the same time the soil bacteria are killed off, but the spores remain, which germinate, and rapidly multiply when the soil is moistened. The new bacterial cultures increase at an enormous rate, and the resulting nitrogenous plant food becomes so great that plant growth is greatly stimulated. The authors then go on to state (p. 120): 'There is reason to suppose, therefore, that the large destructive and competing organisms will be found of common occurrence in ordinary soils, checking the beneficial bacteria and limiting fertility. An important practical problem arises: Is it possible to suppress them in ordinary field soils by any economical and practical process?'

The practice among many of the best cultivators in the Indo-Gangetic plain furnishes a most emphatic affirmative to the above question. It has been the practice of the ryots for centuries past to expose the alluvial soils of the plains of India to the intense heat and light of the Indian hot weather in April and May. The beneficial result on the succeeding crop is extraordinary, and has all the effect of a nitrogenous manuring. It is much more than probable that the result of this weathering is a partial sterilization of the soil, and that Russell and Hutchinson's explanation is the correct one. Except in market-garden crops near the cities, and in crops like sugar-cane and tobacco, manures are but little used in India. The growth of leguminous crops and the weathering of the soil during the hot season appear to be sufficient to keep up the fertility. More nitrogenous manure would, no doubt, be an advantage, but a great deal could be done by the cultivators themselves in weathering the soil during the hot weather in a more efficient manner than at present. . . .

...In collaboration with Mr. H. M. Leake, Economic Botanist to the Government of the United Provinces, we have in progress a series of experiments in which the practical effect of weathering during the hot months, on both the yield and quality of wheat is being ascertained.

YIELD OF LATEX FROM YOUNG CEARA RUBBER TREES.

Some investigations that were made in connexion with this subject are described in Bulletin 19 of the Hawaii Agricultural Experiment Station, entitled *Experiments in Tapping Ceara Rubber Trees*. The first trial was made with eighty trees, which averaged 13¼ inches in circumference at 3 feet from the ground, and were 23 feet in height; the first branches were at 10 feet from the ground. The trees were tapped by means of one vertical cut each day, and nearly thirty-seven hours of labour were required for tapping them, collecting the latex, and obtaining, by coagulation, 1½ lb. of dry rubber. It was found that four ordinary Japanese labourers, who had had no previous experience of the work, could tap eighty trees in a period which varied between seventeen and forty minutes.

In a second lot of trees, which numbered 160 in this case, two vertical cuts were made instead of one, and it only required forty hours of labour to tap the trees, collect the latex, and obtain 7½ lb. of rubber, of which 2½ lb. was scrap. The experiment showed that, with the prices which obtained for rubber at the end of 1909, when two vertical cuts were made daily, profitable returns were obtained from two-year-old trees. It has to be considered that the labour of tapping small trees is greater than that of dealing in the same way with large ones, and that the yield of latex is much lower, so that, with the same amount of labour, more rubber would have been obtained from older trees.

It was found, during the experiments, that one labourer can tap about fifty trees in an hour, while the latex produced by the work of two such labourers can be collected by one. Subsequent experiments with mature Ceara rubber trees have shown that about ⅓-oz. of dry rubber may be obtained as a daily yield from each tree. This leads to the conclusion that three men should be able to obtain rubber from mature trees at the rate of about 1lb. per hour.

In the matter of the relation between the size of the tree and the amount of tapping that can be effected, it was found that the area of bark on plants 4 inches in diameter will permit of tapping, with one vertical cut daily, for two successful weeks, or with two vertical cuts, every day, for one week. Larger trees would, of course, permit of the collection of latex for a much longer period.

GLEANINGS.

The *Board of Trade Journal* for February 1910, states that the cacao crop of the Gold Coast for 1909 amounted to 45,277,606 lb. The similar amount for 1908 was 28,545,910 lb.

According to the *Louisiana Planter* for February 1910, the beet sugar production for continental Europe, is 6,270,000 tons, of which Germany produces 2,050,000 tons, while Austria follows with 1,275,000 tons. Russia is third with an estimated output of 1,175,000 tons.

Agriculture is rapidly progressing in the Argentine Republic as is shown by comparing the cultivated area in 1895 with that of 1908: in 1895 the area under cultivation was 4,892,005 hectares (12,230,013 acres) in 1908 it was 15,830,563 hectares (39,576,408 acres).

The total trade of British Honduras for 1908 amounted to $4,878,522; the value of the imports was $2,676,723; and of the exports $2,201,799. During the preceding period, the values were similarly, $4,626,759, imports $2,415,723, exports $2,211,036, showing an increase for 1908 of $261,000 on imports, and a decrease of $9,237 on exports.

Cocoa-nut plantations in British Honduras have been, and continue to be, very profitable. Cacao does well, and is indigenous in the Colony. The rubber plantations are too young for it to be possible to judge of the results; but, except where the drought followed too closely after planting, the trees have done well. (*Colonial Reports—Annual*, No. 631.)

In a lecture on Egyptian cotton-growing delivered before the Cairo Scientific Society, it was stated that the country is waterlogged, causing a decrease in cotton production last season to 550,000,000 lb., from an advance estimate of 700,000,000 lb. As an example of the decreased production, it is cited that the best land on the state domains seven years ago is now the worst.

Rubber planters in Deli, Sumatra, have agreed to establish an experiment station there for the purpose of investigating the methods for controlling the diseases that attack rubber trees. The work of the station will be directed by a botanist learned in biology, who will enter upon his duties after gaining experience in Ceylon, the Straits Settlements and Java. The number of estates which the scheme will affect is about eighty, occupying an area of approximately 30,000 acres, and each of these will subscribe toward the expenses of the work, in amounts proportional to its area. (The *Straits Times*, December 3, 1909.)

The *Colonial Reports—Annual* No. 630 contains information that, notwithstanding the partial failure of the cotton crop for 1908, the total exports from the Western Province of Nigeria during the year under review was 6,965,536 lb. of a value of £147,000, made up as follows: cotton (including seed) £55,000; maize £52,000; and cacao £40,000.

An abstract of a paper in the *Experiment Station Record*, Vol. XXI, No. 2, of the United States Department of Agriculture, shows that napthalene may be used with success for the purpose of protecting grafts and cuttings from the attacks of the larvae of insects. It is also stated that Vaporite has given good results when employed for that purpose.

The *Pennsylvania Agricultural Experiment Station Report* for 1908 gives particulars of a chemical investigation of the soils of two adjoining fields, which were of the same origin, but which had received different treatment, so that their productiveness was not the same. The results showed that the less productive soil contained a smaller amount of plant food, lost moisture more easily, and was more in need of an application of lime than the more productive one.

In the *Agricultural News* for October 30, last, it was stated that the rice crop of that year, in Japan, was expected to reach 54,300,000 'koku', which is equivalent to about 95,000,000 bags of 180 lb. It is now reported by H. M. Commercial Attaché at Yokohama that the actual, official figures for that crop are 52,423,979 'koku' (about 91,300,000 bags of 180 lb.). Although this is lower than the official estimate, the crop was a record one.

A note on *Spirobolus indicus* and *Spirobolus Jacquemontii* (hair grass; bed grass) appeared on page 46 of the current volume of the *Agricultural News*. In reference to this, Mr. J. H. Hart, F.L.S., has kindly supplied the additional information that these grasses are known as 'hay grass' in Jamaica and Trinidad. This must not be confused with the hay grass that has been accidentally introduced into Antigua, which is *Andropogon caricosus*.

Dealing with the experiments with sugar-cane conducted at the Samalkota station of the Madras Department of Agriculture, the *Report on the Progress of Agriculture in India* for 1907-9 states: 'Among new varieties, the Barbados seedlings B. 208 gave a very good analysis.' In relation to manurial experiments with sugar-cane, the same report states that farmyard manure and castor cake have, as before, given the best results. Increased outputs of canes have been obtained by adding bone dust to the castor cake, and ammonium sulphate to both farmyard manure and the cake.

According to the *Giornale di Sicilia*, 7,005 tons of citrate of lime have been deposited in the warehouses of the Sicilian Green Fruit Chamber (see *Agricultural News*, Vol. VIII, p. 377) since October 25, 1908, when a new export tax came into operation; of this quantity, 500 tons was carried over from the preceding season. Up to June 30, 1909, 1,500 tons of the amount deposited had been sold at 481 lire per cask, or 157 lire per 100 kilograms (6·8*d.* per lb.). In December last, a further quantity of 1,547 tons was sold at the same price, less a discount of 4 per cent. Thus 3,958 tons then remained in stock. It is estimated that the production during the current season will be 4,500 tons.

STUDENTS' CORNER.

APRIL.

FIRST PERIOD.

Seasonal Notes.

Among the pests that attack the sugar-cane most commonly is the moth borer (*Diatraea saccharalis*). Opportunties will probably be afforded at the present time for the study of this insect. Take note of the damage that it does to the sugar-cane and find out exactly in what way this interferes with the life-processes of the plant. In what stage of the insect's existence is it directly harmful? Why is it that this and similar pests are much more in evidence during some seasons than in others? In what ways may this be helped to become a pest through the neglect to remove the débris of plants other than sugar-cane? Information concerning the moth borer of sugar-cane may be found in the following places, among others: *Agricultural News*, Vols. I, pp. 3 and 50; II, p. 65; IV, p. 106; VI, p. 3, and VII, p. 90; *West Indian Bulletin*, Vol. I, p. 327 (where the insect is well illustrated, in all its different stages); II, p. 41; VI, p. 38; *Lectures to Sugar Planters*, No. VI; Pamphlet No. 1 of the Department Series. A useful experiment is afforded by collecting some of the eggs (where are they usually laid?) and putting them into a glass jar, which is closed afterwards by tying a piece of muslin over the mouth. Note that some of the eggs yield caterpillars of the moth, while from others a small hymenopterous insect escapes. Account for the latter fact. Introduce several of these insects into a similar jar containing eggs of the moth borer that have been recently laid, and make notes of what you observe during the next few days.

In the Students' Corner of the issue for December 11, 1909, reference was made to the selection of cotton plants in the field for the purpose of obtaining good seed for the next crop, and the method of effecting this selection was outlined broadly. In the case of a plant like Sea Island cotton, in which self-fertilization takes place to a large extent, it is the best plan, in any given locality, to obtain the seed for future planting either from one plant or from plants that are as closely related as possible. This method of selection gives plants which show very little variation from one another. The continuation of the method is likely to result in the acquirement of plants that are very constant in most of their characters, at any rate, unless they are grown in a locality other than that in which they originated. Even under these conditions of rigid selection, it is found that the plants will vary among themselves in several respects, but little attention need be paid to this, if constant effort is given to the matter of obtaining the best lint.

Where opportunities are afforded, the student should make himself familiar with the way in which sugar is manufactured in his district; if possible, he should gain an insight into other methods of manufacture, in order that he may be able to institute comparisons between them. The chief object of such comparisons will be to gain a knowledge of the advantages and disadvantages of each system, and of the ways in which the different methods of procedure affect the products that are obtained. Which of the processes is the best for the production of marketable molasses? How does the manufacture of sugar by steam boiling (the St. Croix method) reduce the loss of sucrose as compared with that where the muscovado method is employed? What is 'maceration', and how is the extent to which this may be effected related to the expenditure on fuel?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What uses for weeds are there in agriculture?

(2) Describe any form of plough with which you are familiar, mentioning the special uses of its different parts.

(3) What is meant by the physical properties of a soil? Illustrate your answer by reference to a clay soil and a sandy soil.

INTERMEDIATE QUESTIONS.

(1) Give the reasons for burying the cacao pods that remain after picking.

(2) Describe the different stages in the manufacture of sugar by any method of which you know.

(3) Write an account of the principal manures that are used for providing phosphorus, and say how each of them is obtained

PALO AMARILLO RUBBER.

Notes on Palo Amarillo rubber (*Euphorbia fulva*, Stapf) have appeared in the *Agricultural News*, Vol. VI, p. 313, and Vol. VII, p. 396. The additional information which is given below is taken from the *Kew Bulletin*, No. 9, 1909, p. 392:—

Some particulars regarding this plant as a new source of rubber appeared in the *Kew Bulletin*, No. 7, 1907, p. 294. The following supplementary information upon the subject is gathered from an illustrated article on 'The Rubber Plants of Mexico,' by Dr. H. H. Rusby, in *Torreya*, Vol. IX, No. 9, September 1909.

From this paper it appears that the Palo Amarillo will not grow upon the alluvial plains of Mexico, but only on the rocky hill-sides where the drainage is good. The bark is described as being thick and succulent, at first smooth and of a light yellowish-green colour. That of the trunk and large branches soon excoriates in large, very thin, papery, translucent sheets of an orange-yellow, or orange red, colour, which impart to the tree a shaggy appearance, and a colour that has given the trunk its vernacular name 'palo amarillo', or yellow trunk.

The flowers appear in January or thereabout, before the appearance of the new leaves, and the fruits mature in June and July.

As soon as the bark is wounded, a milky juice exudes, which is very irritant, and capable of producing violent inflammation of the eyes if it enters them, as it is quite liable to do in spattering, when the tree is cut.

The great value of this tree as a rubber producer lies in its abundance over large areas, and the proximity of the trees to one another, facilitating collection of the milk, as well as the ease with which it can be propagated, and the rapidity of its growth.

All that is necessary for propagation is to thrust the newly cut branches into the soil, where they practically all grow. From them the tree reaches its full size in from five to seven years. These considerations appear to incline Dr. Rusby to the opinion that, if all other sources of rubber were to fail, this one could probably supply the world's entire requirements.

The properties of the 'palo amarillo' rubber are peculiar. Taken by itself, it is of only medium quality, but mixed in suitable proportion with other varieties, especially with Para rubber, it markedly improves them.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part III.

In the last article, a short account was given of the four main groups into which the fungi are divided. It now remains to discuss these groups and some of their more important subdivisions in somewhat greater detail. This will be the object of the remaining articles of the series.

The Phycomycetes. The group of fungi which contains the most primitive forms is that referred to in the last article as the Phycomycetes. It is subdivided into two main branches: the Oomycetes and the Zygomycetes. The distinctive characters of these are as follows. In the Oomycetes, asexual reproduction is by means of sporangia producing free-swimming zoospores, as described in the case of the Chytridineae*, or the contents of a sporangium may grow out at once and form a germ tube. Sexual reproduction is by means of two specialized organs usually formed on short lateral branches of the hyphae. The female organ is known as the *oogonium*, or egg-forming organ; the male as the *antheridium*. (Fig. 17.)

In the Zygomycetes, asexual reproduction is by means of small non-motile spores produced, usually in large numbers, in a sporangium. The other form of reproduction generally takes place by means of two similar hyphae, which are not sexually differentiated as far as can be seen outwardly. The tips of these two hyphae fuse, (become intimately joined together, the walls between them being absorbed) and a spore is produced at the point of fusion. Such a very simple form of the fertilizing process is known as Conjugation. (Fig. 19)

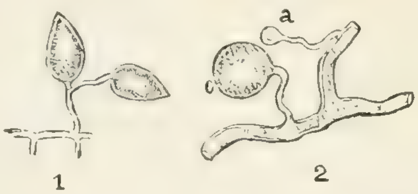

Fig. 17. (1) Conidia, (2) Sexual Reproduction of *Phytophthora omnivora*. (a) Antheridium. (o) Oogonium.

The Oomycetes.—As an example of the life-history of one of the Oomycetes, that of *Phytophthora omnivora* may be described. This fungus causes the black rot disease of cacao pods. The mycelium grows in the tissues of the host, and produces short external hyphae at right angles to the surface; each of these is usually once or twice-branched, and the branches bear terminal large, pear-shaped, conidia. The conidia, when ripe, are distributed by the wind, and when they alight on the surface of another host plant under favourable conditions, germinate, and either form numerous zoospores, each possessing a single cilium, or produce several germ tubes which penetrate into the host plant and form a mycelium directly. This shows that the conidium is really a transformed zoosporangium, or organ for producing zoospores. The zoospores, after swimming for some time in any moisture that there may be on the host plant, come to rest and also produce one or several germ tubes, as described for the conidia, from which the mycelium is formed. Occasionally, a conidium may give rise to only one short hypha, with a small lateral branch, which then bears two terminal secondary conidia similar to the original one.

Fig. 18. Sporangium of *Mucor mucedo*, with Columella.

Sexual reproduction takes place inside the tissues of the host. A short branch grows out from one of the hyphae of the mycelium and becomes very much swollen at the end. The swollen end then becomes separated from the hypha which carries it, by a cross wall. This swollen end is the *oogonium*, and contains the female portion of the sexual spore. (Fig 17,o.) While this is being formed, another lateral hypha arises near the first, and its tip is also cut off by a wall, though it does not swell up as the oogonium does. This is the male organ, or antheridium. (Fig. 17,a.) The tip of the antheridium fuses with the side of the oogonium, and its contents pass into the oogonium and fertilize the egg. After fertilization, the egg cell surrounds itself with a strong thick wall and remains lying inside the old wall of the oogonium. These sexual spores are only liberated by the decay of the tissues of the host plant; this leaves them lying free on the surface of the soil. They are able to germinate and reinfect another host plant as much as four years after their original formation. On germination, they form one or more short hyphae, which almost immediately produce conidia at their tips. This, then, is the life-history of *Phytophthora omnivora*, and that of most of the Oomycetes is very similar. The group includes many well-known parasites, as for example, *Pythium de Baryanum*, which causes the damping oft of many seedlings, the grape mildew (*Plasmopora viticola*) and many others. It presents, moreover, a series of gradational forms, from the most elementary, as instanced in the Chytridineae, to much more elaborate ones, such as *Phytophthora*, and other members of the cohort Peronosporineae.

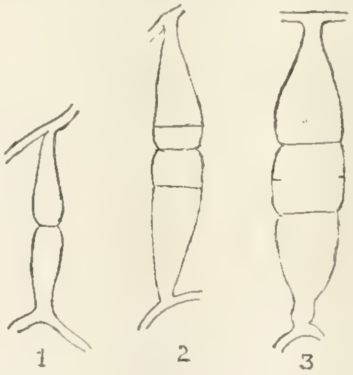

Fig. 19. Stages in the Conjunction of *Mucor stolonifer*.

The zygomycetes.—As an illustration of the life-history of one of the Zygomycetes, that of the Mucors may be described. These fungi are mostly saprophytes, living on many different substances. The mycelium closely resembles that of the Oomycetes, but the reproductive arrangements are somewhat different. In the asexual stage, erect hyphae are produced at right angles to the underlying tissue (substratum). These become swollen at the end, and the swollen portion is cut off by a wall, forming the spore-producing organ, or sporangium. The wall then swells upward into the hollow of the sporangium, and give rise to a central portion, called the *columella*. (Fig. 18.) The contents of the sporangium divide up to produce numerous minute spherical spores, which are liberated by the bursting of the sporangium wall, and are then distributed by the wind.

The other kind of spore is formed as follows: The tips of two neighbouring hyphae become somewhat swollen, and each is cut off by a cross wall. They eventually touch one another and fuse at the point of contact, and their protoplasmic contents unite; in this way a simple form of fertilization is brought about. (Fig. 19.) The spore, consisting of the two swollen ends of the hyphae, becomes surrounded with a thick wall, and is isolated by the decay of the original

*This word was misspelt in the last article, owing to a typographical error.

hyphae from which it was produced. This group mostly contains saprophytes, in the cohort Mucorineae, but the other cohort included in the group, namely the Entomophthorineae, comprises several species of fungi of considerable usefulness from an economic point of view, as they are parasitic on several different insects, and under favourable conditions can keep them well in check. The same is probably true of one or two species of the genus *Mucor*, though these are not so numerous, or of so much use, as the species of *Empusa* and *Entomophthora*, in the group Entomophthorineae.

It may be of interest in passing to note that the characters, on which the families contained in the cohorts mentioned, are separated from one another, are mainly modifications in the appearance of the sexual organs, taken in connexion with the form of the asexual fructifications, such as the amount of branching of the conidiophores, the shape of the conidia, the presence or absence of a columella in the Mucorineae, and similar characters. The species in the various groups are usually separated by much smaller differences, one of the most important being the size of the conidia, or of the spores, as the case may be.

This, then, concludes the description of the most primitive group of fungi, the Phycomycetes, whose forms show every stage of the development of sexual reproduction, from the conjugation of two similar cells to that of two sexually distinct organs, and also the adaptation of the fungi to a land habit by the suppression of the earlier motile zoospores and the alteration of the zoosporangium into a conidium germinating directly, as is shown in *Phytophthora omnivora*, or in a different direction, by the alteration of the zoospores into non-motile air-borne spores, which is what would appear to have occurred in the development of the Mucorineae. In the next article, the numerous higher forms of fungi included in the group Ascomycetes will be discussed.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. L. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of February :—

The anticipated improvement in business in products which find their centre in Mincing Lane, has not been borne out during the month of February. The drug and spice markets have been fairly well supplied, both in quantity and variety, without any special attention being given to any individual product. India rubber has attracted the greatest amount of attention in consequence of the enormous advance in price, which at the time of writing is quoted at 9*s.* 10*d.* per ℔. for Fine Malay Plantation Sheet; so many and so varied are the companies now being floated in every part of the world where rubber yielding-plants are found native, or can possibly be made to grow, that the result must end in some failures.

The following are the details connected with West Indian produce :—

GINGER.

At the auction on the 2nd of the month, no offerings of ginger were made, but it was reported that private sales had been effected at firmer prices, fair washed Cochin realizing 46*s.* and Calicut 47*s.* 6*d.*, 57*s.* 6*d.* being the price quoted for native cut. At the following week's auction, on the 9th, ginger again was not offered, but private business was done with Cochin at slightly advanced rates. At the third spice auction on the 16th, there was again no ginger brought forward, but in the concluding week, about 70 packages of Jamaica were offered and all bought in. It was reported that sales had been effected privately in Liverpool, of 70 tons of Sierra Leone, at prices from 38*s.* 6*d.* to 39*s.*

NUTMEGS, MACE AND PIMENTO.

At the first spice auction on the 2nd of the month, some 300 packages of West Indian nutmegs were offered and disposed of at 1*s.* 4*d.* to 1*s.* 2*d.* per ℔. lower than previous rates. On the 24th, 30 packages, only, of West Indian were brought forward, part of which was sold at from $3\frac{3}{4}d.$ to $5\frac{1}{2}d.$, according to size and quality. In mace the market opened on the 2nd of the month with a firm tone, when 58 packages of West Indian were disposed of at the following rates :— fair good to palish 1*s.* 8*d.* to 1*s.* 9*d.*, and fair red 1*s.* 7*d.* A quantity of good pale flat Java was offered, and bought in at 2*s.* 6*d.*, and pale reddish curly at 2*s.* A week later, 4 packages of West Indian were offered, and sold at slightly advanced prices, 1*s.* 8*d.* being paid for fair red, 1*s.* 7*d.* for good pickings, and 1*s.* 4*d.* for broken. Pimento has attracted but little attention during the month. At the first spice auction on the second of the month, 34 bags of fair were sold at $2\frac{3}{8}d.$, which price remained steady through the rest of the month.

ARROWROOT.

At the first spice auction, arrowroot was represented by 231 barrels of St. Vincent, and 10 half-barrels of Bermuda. All were bought in, the St. Vincent at 2*d.* to $2\frac{3}{4}d.$ per ℔, and the Bermuda at 2*s.* 2*d.* per ℔. On the 23rd, 100 barrels of good manufacturing St. Vincent were offered and bought in at 2*d.* per ℔.

SARSAPARILLA.

At the beginning of the month there was but little demand for this article. At the drug auction on the 10th, some 22 bales of Lima Jamaica were brought forward, the whole of which was bought in at from 1*s.* to 1*s.* 1*d.* per ℔., for common rough to fair. Native Jamaica was represented by 25 bales, 6 only of which found buyers at from 10*d.* to 11*d.* per ℔. for dull yellowish to fair red. For 11 bales of Mixed Guatemala and Mexican, 7*d.* per ℔. was offered and refused; 5 bales of Honduras were also offered and bought in. On the 24th, the offerings consisted of 26 bales of grey Jamaica, all of which were disposed of at the following prices : 1*s.* 2*d.* to 1*s.* 3*d.* for fair, part coarse to good fibrous, and 1*s.* 1*d.* for ordinary. Nine bales of native Jamaica were also offered and 7 sold at 10*d.* to 11*d.* for fair red.

ANNATTO, CANELLA ALBA, CASSIA FISTULA, OIL OF LIME, ETC.

At the beginning of the month, 35 bags of fair bright Ceylon annatto seed found buyers at $2\frac{1}{2}d.$ per ℔.; 9 casks of Canella alba bark were also brought forward, and 4 sold at 42*s.* 6*d.* per cwt. A consignment of fair fresh pods of Cassia Fistula from Java was also offered but not sold, 14*s.* being offered and refused; 15*s.* was the price asked. One box of hand-pressed Dominica Oil of Lime, and 1 of good distilled St. Lucia, were offered at the last sale of the month. The former sold at 5*s.* per ℔., and the latter at 1*s.* 6*d.* Chillies have been in good demand. At one auction in the middle of the month, 131 bags of Nyasaland were sold at 45*s.* to 46*s.* for fair to good bright, 43*s.* for fair red, and 39*s.* 6*d.* to 40*s.* for mixed.

MARKET REPORTS.

London,—The West India Committee Circular, March 15, 1910; Messrs. E. A. de Pass & Co., March 4, 1910.

Arrowroot—No quotations.
Balata—Sheet, 2/9; block, 2/6½ per ℔.
Bees-wax—No quotations.
Cacao—Trinidad, 53/6 to 63/- per cwt.; Grenada, 49/6 to 55/- per cwt.; Jamaica, 48/- to 53/6.
Coffee—Jamaica, 37/- to 65/-.
Copra—West Indian, £27 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; St. Croix West Indian, 18*d.* to 20½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
Honey—24/- to 32/-.
Isinglass—No quotations.
Lime Juice—Raw, 10*d.* to 1/1; concentrated, £18 5*s.* to £18 10*s.*; Otto of limes, 5/9.
Logwood—No quotations.
Mace—1/7 to 1/9.
Nutmegs—Steady.
Pimento—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per ℔.
Rubber—Para, fine hard, 10/4, fine soft, 10/2; fine Peru, 10/2 per ℔.
Rum—Jamaica, 2/3 to 5/-.
Sugar—Crystals, 18/- to 20/-; Muscovado, 14/3 to 15/9; Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., March 4, 1910.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11⅝c. to 11⅞c.; Trinidad, 11½c. to 12¼c.; Jamaica, 9⅞c. to 10½c. per ℔.
Cocoa-nuts—Jamaica, select, $28·00 to $29·00 culls, $18·00; Trinidad, select, $26·00 to $28·00; culls, $17·00 per M.
Coffee—Jamaica, ordinary, 9c. to 9½c.; good ordinary, 9½c. to 9¾c.; and washed, up to 11½c. per ℔.
Ginger—9½c. to 13c. per ℔.
Goat Skins—Jamaica, no quotations; Barbados, 45c. to 48c.; St. Thomas, St. Croix, St. Kitts, 42c. to 45c. per ℔.; Antigua, 45c. to 48c., dry flint.
Grape Fruit—$3·25 to $3·50 per box.
Limes—No quotations.
Mace—32c. to 36c. per ℔.
Nutmegs—110's, 8¾c. per ℔.
Oranges—Jamaica, no quotations.
Pimento—4⅛c. to 4¼c. per ℔.
Sugar—Centrifugals, 96°, 4·39c. per ℔.; Muscovados, 89°, 3·89c.; Molasses, 89°, 3·64c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., March 19, 1910.

Cacao—Venezuelan, $12·30 per fanega; Trinidad, $12·00 to $12·25.
Cocoa-nut Oil—92c. per Imperial gallon.
Coffee—Venezuelan, 10¾c. per ℔.
Copra—$4·80 per 100 ℔.
Dhal—$4·40 per 2-bushel bag.
Onions—$3·50 per 100 lb.
Peas, Split—$6·75 to $7·00 per bag.
Potatos—English, $1·00 to $1·50 per 100 ℔.
Rice—Yellow, $4·75 to $4·90; White, $5·00 to $5·10 per bag.
Sugar—American crushed, $5·10 to $5·20 per 100 ℔.

Barbados,—Messrs. Leacock & Co., March 26, 1910; Messrs. T. S. Garraway & Co., March 29, 1910.

Arrowroot—St. Vincent, $3·40 to $3·75 per 100 ℔.
Cacao—$10·50 to $12·00 per 100 ℔.
Cocoa-nuts—$14·00.
Coffee—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 ℔., scarce.
Hay—$1·20 per 100 ℔., dull.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—Bunched, $2·50 to $3·50 per 100 lb.
Peas, Split—$6·20 to $6·25 per bag of 210 ℔.; Canada, $3·50 per bag of 120 ℔.
Potatos—Nova Scotia, $2·00 to $2·75 per 160 ℔.
Rice—Ballam, $4·33 to $4·60 (180 ℔.); Patna, $3·80; Rangoon, $3·00 per 100 ℔.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, March 19, 1910; Messrs. Sandbach, Parker & Co., March 18, 1910.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 to $8·25 per 200 ℔.	$8·00 to $8·25 per 200 ℔., market dull
Balata—Venezuela block	32c. per ℔.	Prohibited
Demerara sheet	48c. per ℔.	None
Cacao—Native	11c. to 12c. per ℔.	10c. to 11c. per ℔.
Cassava—	96c.	No quotation
Cassava Starch—	$6·00 per barrel of 196 ℔.	No quotation
Cocoa-nuts—	$12 to $16 per M.	$16 per M., peeled and selected
Coffee—Creole	12c. to 13c per ℔.	12c. to 13c. per ℔.
Jamaica and Rio	14c. to 14½c. per ℔.	14½c. to 14¾c. per ℔
Liberian	10c. per ℔.	10c. per ℔.
Dhal—	$4·75 per bag of 168 ℔.	$4·65 to $4·75 per bag of 168 ℔.
Green Dhal	$5·75	——
Eddos—	$1·44 per barrel	——
Molasses—Yellow	None	——
Onions—Teneriffe	—	No quotation
Madeira		No quotation
Peas—Split	$6·45 to $6·50 per bag (210 ℔.)	$6·50 per bag (210 ℔.)
Marseilles	$3·50	$3·50 to $4·25
Plantains—	20c. to 60c. per bunch	——
Potatos—Nova Scotia	$2·25 to $2·50	$2·40
Lisbon	No quotation	No quotation
Potatos—Sweet, Barbados	$1·44 per bag	——
Rice—Ballam	No quotation	$4·75
Creole	$4·00 to $4·20	$3·80 to $4·00
Tannias—	$1·92 per bag	——
Yams—White	$1·92	——
Buck	$2·16 per bag	——
Sugar—Dark crystals	$3·00 to $3·10	None
Yellow	$3·25	None
White	$3·75 to $3·80	$3·60 to $3·80
Molasses	$2·00 to $2·25	none
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Introduction of Useful Birds.

NO account is required of the reasons why it is deemed expedient, in many cases, to effect the introduction of birds into agricultural countries or districts. Certain birds have become notable on account of their insectivorous habits, and the desire has arisen to introduce them into countries where they do not already exist. Great care is required in deciding whether the presence of such birds in a new country will eventually be of advantage to it, and the question naturally opens up the subject of the protection of the useful birds that are native to that country. This protection may be extended to certain birds on account of the desire to conserve rare and interesting species, or because of reasons of sentiment, or, as is more usually the case, in order that the destruction of useful birds may be checked. The last form of protection is more necessary now, than it has ever been in the past, because of the continual increase in the area of land that is being taken up for cultivation, in most agricultural countries, and the consequent lessening of the number of places where the birds can find their natural homes.

The subject of the protection of the birds already existent in a country deserves further consideration, as it fitly brings up that of the introduction of birds. It must be remembered that the provision of such protection acts in two ways: it not only conserves the birds in favour of which it is effected, but it leads to the greater destruction of the unprotected ones. Among the latter, there may be species that are useful, from the point of view of their insectivorous qualities, but which are destructive in other ways, as for example, the chicken hawk, in the West Indies. It would seem advisable, therefore, in the case of such birds, not to offer bounties for their destruction, but to trust to the fact that they are not protected, to keep their numbers within reasonable bounds. Among small birds, too, care is required in making exceptions to the provisions of a protection ordinance, for valuable ones may be continually destroyed and the fact not be discovered, owing to the small difference that exists, to the uneducated observer, between these and certain of the harmful kinds.

Enough has been said, in a general way, to indicate the importance that the protection of native birds bears, when any scheme for the introduction of foreign species is being considered. There is,

however, another, particular view of the case which has its origin in the dangers that attend the making of such introductions. These are sufficiently serious, as will be shown later, and their existence leads back to the original question of what can be done, in the case of a given country to conserve the useful birds that are already found there.

In arriving at a conclusion as to the expediency of obtaining a species from another country to do the work of keeping down insects, the first attention will be given to its behaviour in its native land. It will naturally have had attention drawn to it by the good that is effected by it, but this view must not obscure the need for thorough investigation of its habits, in order that the presence of any untoward traits in its character, which might develop under changed conditions, may be discovered. One of the greatest of such changed circumstances will be that, most probably, its natural enemies will be absent from the country to which it is taken, with the result that the increase in numbers that is permitted will necessitate a change in the nature of the food, and the bird may develop fruit-eating or grain-eating habits to such an extent as to become a pest to agriculturists. It is in this connexion that the importance seems to be indicated of the possession by all colonies of stringent laws regulating the introduction of animals of every kind, so that this would only take place, in the case of any given species, after thorough consideration of its advisability, under the advantages of expert assistance.

The greatest care is required in examining both native and introduced birds for the purpose of determining if they possess feeding habits which will be of benefit to the agriculturist. Such an investigation, if it is to give trustworthy results, must not be confined to one season of the year or to one set of climatic and local conditions. Observations have shown that birds of various kinds show more adaptability to different foods than is generally recognized, and that if they are driven by stress of circumstances to adopt a vegetable diet, they do not necessarily continue such feeding habits when the restoration of normal conditions takes place. The adverse conditions may be temporary for climatological reasons, or permanent, from local causes, and it is manifestly unfair to make conclusions about the feeding habits of a species until it has been examined under as wide a variety of conditions in time and space as is possible. A fair investigation of this description will probably show, in many cases, that the ability of a bird to subsist on vegetable food for a time is a characteristic in its favour, rather than against it, for it merely takes a temporary toll from the agriculturist, in order that it may survive to do the work that he expects of it, in the future. A fuller recognition of these facts would probably end much of the conflicting evidence that is obtained when enquiries as to the usefulness or otherwise of a given species are made.

After due attention has been paid to all these considerations, it may be decided that it is expedient to assist the useful native birds in the work of the destruction of insects by bringing in others which have similar feeding habits. This decision calls, again, for caution, in another way. The insect population of an island is subject to large fluctuations—a fact that is brought home to every agriculturist, sometimes in an unpleasant manner. There is also the fact that the food-supply per head is reduced by the advent of the new-comers. The possibility has therefore to be faced that, owing to the competition arising from the reduced amount of food, the native birds of the island, which once served a useful purpose, will be driven to subsist to an increasing extent on fruit and other agricultural products, and may in the end do more damage than the insects which it was desired to control.

The facts that have been brought forward will serve to show that great risk attends the introduction of new species of birds into a country, and that it is difficult to gauge the ultimate effects that may result from their presence. This leads to the suggestion of another precaution, namely, that these birds should, if possible, possess a period in their life-history during which their habits are such that they can be destroyed with comparative ease; for instance, the purpose will be served if the nests are made in accessible positions, so that either the breeding birds, the eggs or the nestlings may be taken. It may be argued that the existence of this very circumstance will operate against the acclimatization of the bird, owing to the chance that it gives for its destruction by enemies. This is actually the case, but the proper regulation of the conditions under which it is introduced should enable it to reach such numbers as to prevent the possibility of its extermination in that way.

From past experience in the West Indies, it appears that the establishment of a species of bird in a new habitat is by no means a simple matter, and several failures have been recorded. In the light of this, it would seem that, especially in the case of gregarious birds, they should be imported in large numbers; that several importations, at fairly short intervals, should be made; and that there should be provision for

feeding and looking after the birds for some little time subsequent to their arrival.

The broad conclusion that is reached after all these considerations is that caution is required at every stage of the work connected with the introduction of new species of birds into a conntry. It appears as if the risks might be minimized in the West Indies by effecting interchanges between the different islands, instead of obtaining importations from other parts of the world, but there is no certainty in the matter. Every effort should be made to ascertain what can be done by the protection of already existing useful birds. In gaining information concerning the feeding habits of these, as well as of others that it may be proposed to introduce, care should be taken that what is obtained applies to normal conditions. Finally, where birds are introduced, the work should be conducted in a methodical manner, in order that the best chance of survival may be given, and the most reliable information may be available as to the effect of their presence in their new habitat.

THE COST OF SUGAR PRODUCTION IN THE UNITED STATES.

The following is taken from an article by G. T. Surface, Assistant Professor of Geography, Sheffield Scientific School, Yale University, which appeared in the *Annals of the American Academy of Political and Social Science,* January 1910:—

The cost of sugar production naturally varies for different years, and in different localities for the same year. The reserve of seed-cane represents a heavy initial cost, since a minimum of 3 tons per acre is required, or about one-fifth of the average crop. This could be milled at less cost than the 'windrowing' for winter preservation, so at present mill prices it represents an outlay of $12 to $16. In 1899, 3,870 farms in Louisiana, on which cane was the chief source of income, reported that the expenditures for labour and fertilizers amounted to 45 per cent. of the gross income. On the liberal estimate of 16 tons per acre and $4 per ton, the average cost of the labour and fertilizers was $28·80 per acre, leaving $35·20 to cover cost of sowing, risks, rental or interest charges, repairs, horse power and profits. The risk from storm losses is great, since the cane belt is in the zone of our most violent coastal storms. The total loss to the sugar-cane crop of Louisiana from the storm of September 20, 1909, is estimated at 2·89 per cent. ($650,000) by Professor H. P. Agee, of the State Experimental Station. The losses in the Mississippi and Yazoo delta districts varied from 10 to 20 per cent., and in Texas from 11 to 25 per cent. The shallow rooting of cane and the weight and the brittleness of the stalk make destructive not only windstorms but heavy or continued rains.

The cost of labour has so increased during the past two decades that the industry would have declined but for the economies inaugurated in the different stages of production. From 1890 to 1900, the cost of unskilled farm labour in the cane-growing States increased from 20 to 30 per cent., while the price of granulated sugar declined from 6·3c. per lb. (1890) to 5·3c. From 1900 to 1909 wages increased more than 20 per cent., and granulated sugar declined from 5·3c. to 4·68c. per lb. According to the statement of conservative planters, the cost of producing raw cane sugar somewhat exceeds 2½c. per lb., and under the present economic conditions, a reasonable profit cannot be realized unless the factory price averages 2½c. to 3½c. per lb. for the different grades of raw sugar. The cost of factory equipment is estimated at $250 for each ton of cane which can be milled per day; that is, a factory of 2,000 tons daily capacity would cost $500,000.

EXPERIMENTAL GARDENS IN CEYLON.

The following details of a scheme for the provision of experimental and model gardens in Ceylon, that has been drawn up by the Ceylon Board of Agriculture, are given in the *Tropical Agriculturist* for January, 1910:—

(1) The Ceylon Board of Agricnlture is prepared to make grants-in-aid to local Societies for the establishment and maintenance of experimental gardens for the next five years, commencing from July 1, 1910.

(2) Applications for such grants-in-aid will be received by the Secretary of the Board of Agriculture up to March 31, 1910. These applications will be considered by the Advisory Committee on Model and Experimental Gardens.

(3) It is proposed for the present to subsidize one garden in each province.

(4) The parent society will give in the first year an initial grant not exceeding Rs. 1,000 for the starting of a garden, and an upkeep grant not exceeding Rs. 200 per annum for five years, on condition that the local Society will contribute sums not less than those granted. These sums may be exceeded in the case of certain provinces should funds become available through failure of the scheme in others.

(5) Gardens established under this scheme should not as a rule be less than 5 acres, but in no case will any site less than 3 acres in extent be allowed. They must be within easy reach of some public road, and the sites must be approved by the parent Society.

(6) The land should either be purchased outright or leased for a period of not less than five years, and be available for the sole use of the garden.

(7) The funds contributed by the local Society for the working of the garden should be deposited with the Government Agent of the province, either in a lump sum annually or in instalments; and the Society's grant will be similarly deposited with the Government Agent, on intimation being received of the deposit of the local Society's contribution.

(8) The garden will be under the supervision and control of the parent Society, and cultivation and experiments will be conducted according to a scheme to be drawn up by the Advisory Committee.

(9) Proper accounts of all expenditure, with receipts, should be kept on an approved system by the local Societies, and a copy of such accounts forwarded to the parent Society half-yearly. The books shall be open to the inspection of officers of the parent Society.

(10) The local Society should be properly represented, and controlled by a local board, with the Government Agent of the province, or the Assistant Government Agent of the District, as its Chairman.

WEST INDIAN FRUIT.

THE PROPAGATION OF THE AVOCADO PEAR.

The following account of a method for propagating the avocado pear is taken from the *Bulletin of the Department of Agriculture*, Bahamas, Vol. IV, No. 4:—

As in the early days of the orange industry, the budding of citrus fruits was thought to be very difficult, so the budding of the avocado was at first considered a complicated operation, but the difficulties are rapidly being cleared away, as experience is accumulated, and by experiments. The writer has frequently succeeded in getting an average of 75 per cent. of buds to develop into trees. The general impression is that the avocado is difficult to transplant, and, budded trees being expensive, those buying trees prefer to purchase them established in boxes or pots. To meet this demand, the seed is placed in the pot and allowed to develop until it is ready to bud; or the seed is planted in a nursery in rows $3\frac{1}{2}$ to $4\frac{1}{2}$ feet apart, 6 to 8 inches apart in the row, where the trees grow until they are budded and ready for the market, when they are taken out of the nursery and planted in pots or boxes, where they remain until they are well established; this will take from four to six weeks.

The method of budding is the same as that employed in the budding of citrus fruits. Many complaints have been made that the buds do not take, or that they do not start readily. This is due, not to an inherent difficulty in the budding of the avocado, but rather to the inexperience of the performer, either in budding, or, more frequently, in the selection of bud-wood. Only large, well-developed buds should be inserted, and these should be rather larger than citrus buds—certainly not less than $\frac{3}{4}$-inch in length and preferably 1 inch, as small buds are frequently grown over, where the stock is in a vigorous condition, as it should be. In experiments, it has been found that tender wood is preferable to older wood, and even soft and tender tops, inserted as spring buds, have been used with perfect success. Where old and hardened wood is employed, the buds frequently drop, making a 'blind bud'. For wrapping the buds waxed cloth is preferable to string, as it affords the bud better protection from injury and water. The buds should be inserted during the spring and early summer, and not later than August. Two weeks from the date of budding, they have taken, and the trees are ready to be lopped. The trees should now be examined every two weeks, the wild sprouts rubbed off, and when the buds have made a growth of 8 to 12 inches, the stock may be trimmed back to the bud. It frequently occurs at this period that a fungus, *Colletotrichum* sp., enters the wound and kills the bud. The loss of buds may be diminished by covering the cut with grafting wax, to prevent the entrance of the fungus.

The discovery of the feasibility of budding the avocado being very recent, only a few varieties have been distributed. Of these, the best known are the Trapp, a variety fruiting until Christmas, and commanding a fancy price because of its lateness. The Pollock, which bears a pear-shaped fruit, is known mainly for the size of the latter, which has been recorded as weighing 4 ℔; it has a fine flavour.

Anyone in possession of large unproductive avocados can easily convert them into paying trees by cutting them down about 3 or 4 feet above ground and budding the sprouts, which will soon make a start. For home use, any fruit of good quality will answer the purpose. In budding for a commercial orchard, it should be kept in mind that the very early and late varieties command the highest price. Other desirable points are: (1) prolificness; (2) smooth, thick and leathery skin; (3) a fruit of good keeping qualities; (4) the possession of seeds which fill the middle of the fruit, as a loose seed bruises the flesh, while the fruit is in transit; (5) a small seed.

The best material for making grafting or budding tape is cheap cotton cloth which will tear easily. Rip up the cloth in strips of desired widths, say 6 or 7 inches, and roll these tightly on stout iron wire as long as the width of the cotton strips. Several strips may be rolled on until the roll is 1 inch in diameter; tie a string around the roll at each end to prevent unrolling while being boiled in the wax. A good wax is made by boiling together 2 ℔. of beeswax, 2 ℔. of resin, and $\frac{1}{2}$-℔ of good lard; when the mixture is boiling, put in the rolls of cloth and let them remain for fifteen minutes; take them out, and allow to cool before putting away. The iron wire is more desirable than sticks of wood, as the weight of the wire keeps the roll below the surface of the boiling mass. Another advantage in using the wire is, that if the wooden sticks are not quite dry, the water as it is converted to steam will cause the contents to boil over.

METHODS OF CAUSING EARLY FRUITING IN MANGOS.

On page 228 of the last volume (No. VIII) of the *Agricultural News*, a reference is made to a way in which mango plants may be caused to bear much earlier than is the case normally, in order that the quality of the fruit that they will yield may be determined. It is stated there that Mr. Joseph Jones, the Curator of the Botanic Station, Dominica, had called attention to the fact that the shock caused to the plants by grafting and heading back would in some cases induce the stock to bear fruit when only twenty months old. Others have found that, similarly, twisting the top of the stems of mango seedlings, slightly damaging them, or binding them, will cause early fruiting, and give an opportunity for determining the value of their produce.

The illustration on this page (Fig. 20) has been reproduced from a photograph of a grafted mango plant, sent by Mr. Jones. It shows a mango stock, that has been used for grafting purposes, bearing a well-developed fruit, although its age was only about twenty months.

FIG. 20. STOCK OF GRAFTED MANGO BEARING FRUIT WHEN TWENTY MONTHS OLD.

THE TOGGENBURG GOAT IN BARBADOS.

The pure bred Toggenburg goats 'Bruce' and 'Pauline' were imported into Barbados, from England, by Sir Daniel Morris. This breed comes from the Toggenburg Valley in Canton St. Galle, Switzerland, from which place the ancestors of the above pair were originally derived. Their markings are quite distinctive, being slaty chocolate in colour, with white or cream stripes on either side of the face and ears, round the tail, and below the knees. These markings seem to be a dominant character, as even kids only one-eighth bred are often perfectly marked. On the other hand, although both Bruce and Pauline were polled, most of their progeny, both pure and grades, have horns. In their native valley, a horned specimen is rarely seen, because kids with horns are generally killed and eaten. Their milk, like that of all Swiss breeds, is deficient in butter-fat; a given quantity is still, however, equal to twice the quantity of cows' milk for domestic purposes.

This breed has been described by some authorities as 'The Aristocrats of the Goat Family'. Their chief characteristics are their great leanness, and persistence in giving milk for a long period. Some of them, after travelling about the Continent, were shipped from Antwerp to Canada, then after three days by rail reached their destination, and continued to give milk, though they were never milked during their long travels. They seldom breed more often than once a year, usually having two kids. Some of the half-bred daughters of Bruce have given milk for a very long time. One who won the first prize at the Agricultural Show in 1908, giving nearly 1 gallon of milk, returned in 1909 and won second prizes, then giving 4 pints a day, fourteen months after kidding. Another gave $1\frac{3}{4}$ pints, 19 months after having her first litter, being then six weeks in kid. The quantity a ewe gives, six months after kidding, she will generally keep up for an almost unlimited time.

Wallace, the son of the above pair of goats, is at present on service in Bridgetown; he is a very handsome specimen, and typical of the breed. Dr. Francis Watts has very kindly undertaken to import a few more of this breed direct from Switzerland, and a ram is expected for a local syndicate in a short time, the others being on order for the other West Indian Islands.

Toggenburgs have been in much greater demand here than either the Anglo-Nubians or Indians (Punjab), both for local use and shipment; but owners of particularly good ewes are not tempted to part with them at any price. The local value of a fair half-bred ewe is from \$12 to \$24, but for a really good animal, owners would probably refuse 2 to 3 times the latter price. In comparison with the cost of importing a pure bred goat (which may not turn out as good a milker), these prices are low. Authorities assert that any breed of goats can be made into good milkers by selection, and this the natives of the Toggenburg Valley have been doing from time immemorial, breeding only from the longest and heaviest milkers. The result is that not only do these goats give a large quantity of milk, but they can continue to do so longer than any other breed. It is for this reason that the Toggenburg breed is the favourite as a family milk goat, not only here, but in England, the West Indies generally, and many parts of the Continent and the United States. (The *Barbados Standard*, March 19, 1910.)

A New Machine for Cultivating Sugar-cane.

In view of the increased interest that is being taken in mechanical tillage in the West Indies, the following extract from a letter to the Secretary of the Interior, Philippine Islands, which appears in the *Philippine Agricultural Review*, is given here:—

About June 1, I received a cultivator for sugar-cane—a rolling barrel and 300-metre cable which, attached to my traction engine, I have been using for cultivating my sugar plantations. This appliance is $3\frac{1}{2}$ feet wide, and can easily pass between the rows of cane. It has five spokes, or arms, with five small teeth, which, without any difficulty, penetrate the soil from 15 to 18 inches. As it is a single machine, it needs to be drawn across the field by an animal. In order to solve this difficulty, I contemplate ordering another cultivator of this kind, and will then attach a cultivator to each end of the cable, so that, as one comes across the field, the other may go, and in this manner it will be possible to do about 50 to 60 per cent. more work with little more expense. The sugar plantations worked with this cultivator appear to do better than the others, thanks to these implements, and in spite of the many difficulties which have harassed us.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 24, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, a good business has been done in West Indian Sea Island cotton, at hardening rates for all qualities.

About 450 bales have been sold, chiefly Montserrat at 18*d.* to 21*d.*; Barbados 20*d.* to 21*d.*, with a few superior bales at 22*d.* and 23*d.*; St. Kitts 15½*d.* to 21*d.*; Anguilla 20½*d.* to 21*d.*; Tobago 21*d.*; Barbuda 20*d.*; Antigua 20*d.* to 21*d.*, with a few superfine bales at 23*d.*; St. Vincent 22*d.* to 24*d.*, and 2 very choice bags at 26*d.*

Cable advices from Egypt state that the weather is unfavourable for planting.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 19, is as follows:—

There was a good demand this week for export, resulting in the sale of a number of planters' crop lots of Extra Fine, aggregating 225 bales, at prices ranging from 45c. to 50c. The unsold stock is now very much reduced, and consists of planters' crop lots, held at 40c., 50c., and 60c.

COTTON EXPORTS FROM THE WEST INDIES.

The following tables give the exports of cotton from the West Indies for the quarter ending September 30, 1909, the quarter ending December 31, 1909, and for the year 1909, respectively. It will be seen that the figures in the last table refer to the civil, not to the crop, year:—

QUARTER ENDING SEPTEMBER 30, 1909.

Origin.	Number of bales.	Weight, lb.	Estimated value, £	s.	d.
Antigua	32	7,100	384	11	8
Barbados	320	155,103	7,755	3	0
Grenada	85	25,564	990	15	9
Montserrat	...	...	...	...	...
St. Kitts	3	600	32	10	0
Nevis	13	3,070	166	5	10
Anguilla	1	200	10	16	8
St. Vincent	46½	14,912	780	18	4
Trinidad } Tobago }	13	2,011	(none given)		
Virgin Islands	...	...	...	...	...
Demerara	...	...	...	...	...
Jamaica	33	6,034	234	15	6
Total	546½	214,594	(10,355	16	9)

All this cotton was sent to the United Kingdom, with the exception of 18 bales (8,746 lb.), of an estimated value of £437 6*s.*, which was shipped from Barbados to the United States.

QUARTER ENDING DECEMBER 31, 1909.

Origin.	Number of bales.	Weight, lb.	Estimated value, £.	s.	d.
Antigua	...	...	...	...	...
Barbados	285	137,569	6,878	9	0
Grenada	10	3,360	231	0	0
Montserrat	171	62,494	4,296	9	3
St. Kitts	284	96,226	6,816	0	2
Nevis	80	21,978	1,556	15	6
Anguilla	34	6,800	481	13	4
St. Vincent	38	13,670	968	5	10
Trinidad } Tobago }	...	...	...	...	...
Virgin Islands	...	...	...	...	...
Demerara	...	...	...	...	...
Jamaica	3	160	8	0	0
Total	905	342,257	21,236	13	1

All this cotton was sent to the United Kingdom, with the exception of 8 bales (3,584 lb.), of an estimated value of £179 4*s.*, which was shipped from Barbados to the United States. All the cotton exported was Sea Island.

JANUARY TO DECEMBER 1909.

Quarter ending—	Number of bales.	Weight, lb.	Estimated value. £	s.	d.
March 31	2,532½	887,896	47,744	7	7
June 30	2,479¾	797,542	35,109	17	8
September 30	546½	214,594	10,355	16	9
December 31	905	342,257	21,236	13	1
Total for 1909	6,463¾	2,242,289	114,446	15	1

THE COTTON CROP IN ANTIGUA.

A report on the cotton crop of Antigua for the season 1909-10 has been received from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands. According to this, the area planted in cotton in that island was 253 acres. The general tendency was to plant cotton earlier than has been the case in the past, so that most of the seed was sown before the middle of August, 1909. The germination of the seed was fairly good, on the whole, and the seedlings grew moderately well, although they were checked by dry weather to a certain extent. There were no very serious insect attacks. From experience in recent seasons,

it is natural that the flower-bud maggot causes greater apprehension to cotton-growers in Antigua than any other insect pest. The gist of Mr. Tempany's observations in connexion with the maggot is given in the Insect Notes of this issue of the *Agricultural News*, together with further information by the Entomologist to the Department. The fact of greatest importance in connexion with the matter is that the best means for combating this pest is provided by early planting. The matter has been dealt with quite recently in the *Agricultural News* (Vol. IX, p. 86), and may be resolved by saying that the sowing of cotton should be done as early as possible after the end of May, given sufficient rainfall to ensure successful germination and a good stand of plants, and if this condition has not been fulfilled by the end of July, the idea of growing cotton must be abandoned, and its place taken by some other suitable crop, or crops.

The yields of cotton have varied to a large extent on different estates; they have been most generally affected by the degree to which the attacks of the flower-bud maggot have taken place in the different districts. The best yield, so far, has been obtained at Crumpland, an estate in the north-eastern part of the island, where there has been a return of nearly 1 bale (230 ℔.) to the acre. The amount of cotton that had been ginned in the island up to March 18 was 104 bales of 230 ℔. weight, and there was material in store for making 11 bales more, so that the amount of lint that had been picked, up to that date, was 115 bales. It is possible, according to Mr. Tempany's estimate, that under the most favourable circumstances, 150 bales will have been shipped by the end of the season. If this forecast is realized, the yield of lint per acre will have been 136 ℔. This is a much greater return than any of those of the last three crops, which were as follows:—

Year.	Lint, ℔.
1906-7	100·5
1907-8	73·0
1908-9	56·6

This is a subject for encouragement, and would seem to show the wisdom of early planting. The matter is summed up in the report from which the above information is obtained, by the expression of the probability that the future of the cotton industry in Antigua will depend, to an extent, in the districts where the flower-bud maggot is present, on the ability to obtain a profitable first picking before the middle of December.

COMPOSITION OF THE LATEX OF SOME RUBBER TREES.

Analytical notes of rubber plants that are growing in the Botanical Gardens, Singapore, are given in the *Agricultural Bulletin of the Straits and Federated Malay States* for February, 1910. The information that appears in relation to Para rubber trees (*Hevea brasiliensis*), a West African rubber vine (*Landolphia Heudelotii*), and Ceara rubber (*Manihot Glaziovii*) is reproduced below:—

HEVEA BRASILIENSIS. The latex was obtained from one 32-year old tree, tapped at 6·30 a.m. No water was added to the latex, and the formalin used was carefully measured, so that the amount of latex is known. In the figures given below, this formalin has been corrected for; thus they refer to pure latex.

The total yield from this tree at one tapping was 27 fluid oz. of latex. It was thick, white, and of very agreeable odour.

The coagulum obtained by use of acetic acid was analyzed, and the amounts of several of the other constituents determined. The dry rubber has the following composition:—

	Per cent.
Rubber	98·14
Resin	1·86

Albumens were not determined (as they should be for strictly accurate results). Their amount is small, compared to the total, and the usual acetone extraction gives figures that are near enough to the truth for all ordinary purposes.

The analysis of the latex is:—

	Per cent.		Per cent.
Coagulum	36·29	Rubber	35·55
		Resin	0·67
		Ash	0·07
Serum solids	2·63	Organic matter	2·30
		Ash	0·33
Water	61·08	Water	61·08

The solids soluble in water (tannins, colouring matters, pentoses, gums, sugars of the inosite group, etc.) form a brown, sweet-smelling mass of an extremely hygroscopic nature.

The strength and appearance of the rubber were very fine.

The proportion of 36 per cent. coagulable matter in the latex is very high for Para, and is in accordance with the rule that the percentage of rubber in a latex increases as the tree gets older.

LANDOLPHIA HEUDELOTII. The specimen examined was a bush in the Botanical Gardens, growing in an inferior clay soil. It was only a few feet in height, with a diameter of about 2 inches on some of the branches, the basal stem being larger.

The latex ran very slowly from transverse cuts, and coagulated rapidly. The rubber was obtained by picking the clots from the cuts, and was handsome and strong. The analysis of the dry rubber is:—

	Per cent.
Rubber	89·50
Resin	10·50

The dry rubber is of a clear light brown colour, not tacky, and very strong and elastic. Compared to Willughbeia rubber, it has a better colour, and the resin content is less. It is, therefore, a better rubber, as far as can be judged without vulcanization tests.

MANIHOT GLAZIOVII. The specimen examined was taken from a large tree in the Botanical Gardens, Singapore. The bark was quite unlike that of most rubber plants, having a very thin outer layer. This came away from the tree very readily when the knife was used, and a large surface of it was stripped back. On this exposed place, a herring-bone tap was made, the plant was re-tapped again on the following day, and again two days later. The latex tubes are very near the outer surface of the inner bark, and these few successive tappings did not increase the flow of latex to any appreciable extent.

Unlike that of *Hevea brasiliensis*, the latex coagulated quickly in the cut, so that the flow ceased almost immediately; in fact, it was quite impossible to collect it in cups for this reason. The rubber was obtained by stripping it from the cuts. It had a very disagreeable herb-like odour. Analysis gave the following figures, calculated to dry weight:—

	Per cent.
Rubber	90·44
Resin	6·83
Ash	2·73

The rubber is fine and tough, tougher than plantation Para, and very light straw yellow in colour. The ash could, of course, be reduced to a negligible amount by washing.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

In view of the fact that the subject of the introduction of useful birds is being given some attention in the West Indies at the present time, this matter is discussed in the editorial.

Useful information relating to the propagation of the avocado pear (*Persea gratissima*) appears on page 116.

On page 117, suggestions are made for utilizing the influence of injury in producing the early fruiting of mango plants for the purpose of ascertaining the value of seedlings while they are still young. In connexion with these, an illustration (Fig. 20) is given of a mango stock that bore fruit when it was twenty months old.

Information concerning the composition of the later of various rubber plants is presented on page 119.

The Insect Notes of this issue (page 122) have relation to the flower-bud maggot of cotton, and to the screw worm.

The fourth part of the series of articles that are being given under the head of Fungus Notes, entitled The Chief Groups of Fungi, appears on page 126, and has for its subject the Ascomycetes. Fig. 22 is reproduced after Millardet.

Interesting facts are brought forward in the information relating to the care of minor articles used on estates, on page 127.

A New Rubber.

It is reported by H. M. Consul at Loanda, Portuguese West Africa, that rubber is being prepared there by the natives, from *Carpodinus gracilis* by stripping the bark, and beating it while it is immersed in water. *Carpodinus gracilis* (*Kew Bulletin*, 1898, p. 303) belongs to the same natural order as the plant (milk-withe) that gives Forsteronia rubber in Jamaica (*Forsteronia floribunda*), and the 'Macwarrie-balli' (*F. gracilis*) of British Guiana. Rubber has been known to be given by species of *Carpodinus*, for several years.

Prizes Awarded at the Agricultural Schools.

On page 71 of the current volume of the *Agricultural News*, the results of the half-yearly examination of the Agricultural Schools in Dominica, St. Vincent and St. Lucia, held in December last, were given.

As is usual at the second half-yearly examination of the year, prizes of books were awarded on the results. Of these, the senior prize, for the boy who gains the highest marks of those in the senior classes of all three schools, was won by D. Derrick, of St. Vincent Agricultural School. This is the fifth time in succession that this prize has been won by a pupil at that school. Prizes are given for the best junior boy in each of the schools; these were awarded as follows: Dominica, E. Butler: St. Vincent, D. Davis; St. Lucia, G. Moïse.

Prizes in the practical part of the curriculum; that is for work in the garden plots and in the field, are also given in the case of each school. Those for the best work in the garden were gained as follows: Dominica, W. J. Lewis; St. Vincent, D. Derrick; St. Lucia, R. Mason. For work in the field, the awards were to N. Abraham, D. Derrick and B. Monrose, in the same order of schools.

The Garlic Shrub.

A note on the garlic shrub (*Bignonia alliacea*) has been received from Mr. Joseph Jones, Curator of the Botanic Garden and Experiment Station, Dominica, in which he states that a specimen of this plant in the Garden has recently flowered. This was originally received from a planter in the Windward District of Dominica, who stated that it was grown by the peasants at La Plaine and that the leaves were used by them as a substitute for garlic (*Allium sativum*). Mr. Jones states further that the plant appears to have been brought to La Plaine from Martinique, and describes it as possessing a climbing habit and showy flowers; these are pale-purple in colour, on opening, but become white in a few hours.

The plant is a native of Guiana and the West Indies; it is known as the garlic shrub because the leaves and branches, when bruised, emit a powerful odour of garlic. The leaves are divided, with elliptical, leathery leaflets, and the stem is square.

Duss (*Flore Phanérogamique des Antilles Françaises*) gives the common nome for the plant in Martinique as 'bignone à l'ail' (garlic Bignonia), and states

that it was cultivated in the Botanic Garden at St. Pierre in that island. Grisebach, in the *Flora of the British West Indian Islands*, describes the plant under the synonym *Adenocalymna alliacea*, which should be, properly, *A. alliaceum*.

Annual Colonial Report on the Leeward Islands, 1908-9.

This is issued as No. 629 of the *Colonial Reports—Annual*. It may be said, at once, that the report shows that a decided increase in the prosperity of the colony, especially of tke chief Presidency—Antigua—is taking place. This is illustrated in many of the statistics given, but more especially by the fact that the exports of the colony, which had a value of £399,208 in 1906, increased to £516,861 in 1907, and £517,467 in 1908. Another noticeable fact in this connexion is that the internal trade between the presidencies shows an increase over that of the preceding year, its value being £20,843, as against £17,434 for the year 1907—an increase of nearly 20 per cent.

The sugar crop was smaller than it had been since 1905, being 23,572 tons, as against 28,419 and 25,571 tons for 1907 and 1906, respectively. This is attributed chiefly to the heavy rains of September 1906, which prevented the land from being prepared adequately for the next crops, and gave conditions that were favourable for the development of the root disease—a question that is dealt with in Part I of the *Report on Sugar-Cane Experiments in the Leeward Islands*, and in Pamphlet No. 63 of the Department Series.

The two central sugar factories in Antigua made, between them, 5,595 tons of grey crystal sugar, and purchased 6,766 tons of peasant-grown cane. At the Gunthorpes central factory, it took 9·17 tons of cane to make 1 ton of sugar. The use of megass furnaces and steam-heated pans for making muscovado sugar has been extended, and there are now seven estates on which this method is employed. The demand for Antigua muscovado molasses was much greater than usual, during the year, and high prices were realized for it.

In comparison with the set-back that cotton growing has received in Antigua, the industry in St. Kitts may be considered to be generally satisfactory. The yield in Montserrat has decreased, owing to bad weather. The expansion of the industry in the Virgin Islands was maintained. The lime industry of Dominica underwent a considerable advance, and that of Montserrat continues to show a steady development. Interest in lime-growing is increasing in Antigua, St. Kitts, Nevis and the Virgin Islands. The export of cacao from Dominica has decreased: trials with this plant in the more sheltered mountain valleys of St. Kitts and Nevis are being made. There are signs that the cocoa-nut industry may become important in Antigua and Nevis. In nearly all the presidencies, a small quantity of onions is grown.

In drawing attention to this report, mention should be made of two useful maps of the Colony, by which it is completed.

Rainfall in Dominica.

The rainfall returns of Dominica for 1909 show that over 200 inches were registered at five stations: Gleau Manioc (258·82 inches), Lancashire (248·90 inches), Castle Bruce (242·10 inches), Saltoun (239·87 inches), Corlet (217·33 inches). Gleau Manioc thus continues to maintain its position of last year, as the station receiving the highest rainfall; in that year the precipitation was 236·18 inches. In 1907 this station was second on the list, with 227·25 inches, Lancashire being first with 247·59 inches.

Although Batalie had had the smallest amount of rain, of all stations, for the two previous years, its place was taken, in 1909, by Bath, which received 61·72 inches, while the precipitation at Batalie itself was 66·66 inches—a great increase on the amounts for 1908 and 1907, which were 36·87 and 40·26 inches, respectively. These figures show that there has been a large increase in the rainfall, even at those stations where it is usually low.

The mean rainfall at 34 stations was 137·36 inches: this is about 30 inches more than those of 1908 and 1907 (106·21 and 108·51 inches, respectively). After 1906, it decreased by about 20 inches, and remained steady for the next two years; it has now exceeded that of 1906 by 10 inches.

Manufacture of Paper from the Bamboo in Japan.

The American Consul at Tamsui, Japan, reports that very satisfactory experiments have been conducted recently, near Kobé, by a company which has been formed for the purpose of manufacturing paper from bamboo pulp. An area of 8,000 acres of bamboo forest, in Formosa, has been leased perpetually to this company, and a factory is being erected near Kagi which will be capable of dealing with 300 tons of bamboo pulp a month; the capacity of this factory may be readily enlarged, so as to make it double its output.

The Chinese have made paper from the bamboo for many generations, but their primitive methods have only permitted them to employ the shoots for the purpose. The company will, on the other hand, make use of both the young and old parts of the plant. The quick growth of the bamboo will prevent the question of the supply of raw material from ever becoming serious. So far, the paper has been made by mixing wood pulp with that of the bamboo, in varying proportions; the process of preparing the paper from bamboo pulp alone is too expensive, at present, compared with making it from wood pulp. The final object is, however, to use a pure bamboo pulp.

In its broad outline, the process of manufacture of the pulp is as follows. The bamboo, chopped into pieces 1 or 2 inches in size, is heated in a digester with calcium sulphite. The resulting product is then washed in water, bleached and washed again. Finally, the wet pulp is pressed, by means of a machine, into the form of web, dried with the aid of steam, and rolled or cut into sheets. This dry pulp will then be manufactured into news and book paper at the mills at Kobé in Japan.

INSECT NOTES.

THE FLOWER-BUD MAGGOT OF COTTON.

The Superintendent of Agriculture for the Leeward Islands, Mr. H. A. Tempany, B.Sc., has forwarded to the Imperial Commissioner of Agriculture a brief account of the occurrence of the flower-bud maggot in Antigua, during the cotton season of 1909-10.

The attacks of the flower-bud maggot in 1909-10 were remarkable for the manner of their distribution in the island, occurring as they did in several instances on limestone soils, but not at all on those of a volcanic origin. It is also to be noted that none of these attacks prevented the production of fair crops of cotton, and Mr. Tempany remarks that the yield per acre is decidedly larger than the yields of the past three years. None of the direct remedial measures that were experimented with gave results. The investigation to find whether cotton could be infested from privet (*Clerodendron aculeatum*) was without result, because no infested privet could be discovered during the season. In those fields where experiments were laid out with insecticides and fertilizers, the flower-bud maggot did not make its appearance at all, and so there were no results to be recorded. Early planting seems to have been of the greatest value in preventing the attacks of the flower-bud maggot. This practice has been strongly recommended each year since the pest appeared, for in each attack the most serious injury has been done in November and December. This may have been because the seasonal and climatic conditions which are most favourable to the rapid increase of the insects happened to coincide with the period when there was the greatest number of flower buds in a condition suitable for attack. The flower-bud maggot may not become a serious pest, under two conditions: (1) that cotton is planted early—say in May or June; (2) that the weather conditions later in the year are such that the insect does not appear until a sufficient number of buds has developed to ensure a good first picking. The conclusion to be arrived at from past experience seems to be that the future of the cotton industry in Antigua depends on the ability of the planters to get seed planted early, in order that the flowers to make the first picking may be sufficiently advanced not to be liable to attack when the conditions become most favourable for the insect. This favourable season seems to be between the middle of November and the middle of December, and it is likely that any buds that open before that time will escape the attack.

THE SCREW WORM.

In 1902, the screw worm, which is the larva of a fly (*Compsomyia macellaria*) was so abundant in the island of St. Lucia, in 1901-2, as to be a serious pest, and a pamphlet was published by this Department (Pamphlet Series, No. 14), giving an account of the appearance and habits of the insect and of the remedies to be used against it. The screw worm develops into a fly similar in appearance to the bluebottle fly; it is about the size of the house fly, or a little larger, of a metallic blue or green colour, and it is marked on the dorsal surface of the thorax with three dark longitudinal lines, extending from behind the head to between the wings.

The egg is white, cigar-shaped, and several of them are generally glued together in a bundle, when laid. They are larger than the eggs of the house fly. They hatch in one to forty-eight hours. The maggot is a white, footless worm-like creature, tapering almost to a point in front, and ending bluntly behind. At the hinder end, there are two dark spots—the openings of the breathing apparatus, which are placed in this way in order to allow the maggots to bury themselves in the flesh of an animal, and still to breathe the outer air. The full grown maggot is from ½-to ¾-inch in length. This stage lasts from seven to ten days. The pupa is brownish in colour, oval in shape, seed-like in appearance, and about ⅓-inch in length. The pupal condition lasts from fourteen to twenty-one days, after which the fly appears. The screw worm is of importance from its habit of infesting wounds and open sores on domestic animals. The female fly lays its eggs in these places, and the maggot feeds on the flesh, thus increasing the depth of the sores. Such infested wounds and sores, left without care and attention, are very likely to cause the death of the animal.

In treating the wounds attacked by the screw worm, two objects are to be aimed at: the removal of the maggots, and the disinfection of the wound. The sooner that treatment can be commenced after the wound is made, the better the chances for successful results. The first step in dealing with these attacks is thorough cleansing of the wound by washing with clean water, which should be warm, if possible; the next is the removal of any maggots that can be seen; finally, a suitable dressing is applied. An examination should be made after about 12 hours, for the removal of dead maggots and the renewal of the dressing, in order to promote healing and to prevent blood poisoning.

There are several good dressings which may be used for the purpose. Equal parts of carbolic acid and sweet oil may be applied to the wound to kill the maggots, and as a disinfectant. Carbolic acid alone, applied carefully, or Jeyes' fluid, may be used for the same purpose. Tar is useful for covering fresh wounds and cuts, to prevent the access of the flies, or for keeping flies away from wounds which have had the maggots removed and have been dressed. Fish oil is also useful as a repellant for the flies.

A short time ago, a correspondent in Barbados sent a flying fish attacked by maggots to the Head Office of this Department. The maggots were found in the flesh of the fish, which was firm and healthy, within a few hours after it was caught; they were nearly full grown, and must have been four or five days old. Specimens were sent to the United States National Museum, where they were identified as: 'Probably *Chrysomyia*, not the screw worm (*C. macellaria*) but closely allied thereto.' This is an interesting case of parasitism, and it is difficult to understand how the fly—the parent of the maggots—found opportunity to deposit eggs in or on the body of the fish. It might be possible that the eggs were laid in the bait, which is prepared on shore, and that the maggots, being swallowed by the fish, were able to penetrate into the fleshy parts and live and grow there.

The group of flies to which the screw worm belongs is of wide distribution, and its members, at times, become very abundant. The screw worm fly has been classified in at least three different genera (*Compsomyia*, *Lucilia* and *Chrysomyia*) and under some twenty-seven different specific names. It attacks ordinarily all domestic animals, and there are species which are found on various wild animals; cases are on record, even, of attacks on human beings, a large proportion of which proved fatal. The range of hosts is even greater than this, for, in addition to the case of a related insect attacking the flying fish, which has been mentioned above, larvae of a species of *Lucilia* have been found in living and newly dead toads, and one of the bluebottle flies (*Lucilia caesar*) has been observed depositing eggs in a living nestling of the mistle thrush that had fallen from the nest.

OUR BOOK SHELF. NOTES and REVIEWS.

THE WEST INDIES. GENERAL INFORMATION FOR INTENDING SETTLERS. Issued by the Emigrants' Information Office.

This is one of the valuable series of hand-books issued from the Emigrants' Information Office, 31, Broadway, Westminster, S.W. (whence it may be obtained at the price of 6*d.*), which have for their purpose the supplying of useful had trustworthy information respecting emigration, chiefly to the British Colonies.

The first fifteen pages of the book are devoted to giving information concerning the West Indies in a very general manner. This relates to areas, population, climate, postal matters, telegraphs, railways, steamers and fares, products, customs, money, education, hospitals, openings for emigrants, professional employment, commercial travellers, permission to practise medicine, hints to emigrants, cost of living. This part is followed by paragraphs having reference to the West Indian Royal Commission of 1896 and the Imperial Department of Agriculture. The bulk of the book is then concerned with detailed information with respect to the different parts of the West Indies. This is given in a very thorough manner, and in a sufficiently interesting way to appeal to the ordinary seeker after information, and not only to the emigrant. The book should be of interest and use to visitors to the West Indies, as it contains matters of knowledge that will concern them directly, more especially in the form of paragraphs containing hints for visitors. As regards settlers, a piece of advice that is given to these in the Leeward Islands section applies equally well to most of the remaining part of the West Indies. It runs: 'The settler who wishes to invest money and cultivate his own land should make no investment until he has lived for some little time in the island which he selects; indeed, it would prove of material assistance to him if he were to spend a year or so actually working as an overseer in a business similar to that in which he proposes to invest. In this way he would learn the habits of the people with whom he has to work, and would have opportunities of studying his future plans.'

A fair map, which, however, is too small to present the smaller islands on a scale by which their sizes may be compared, is included. The work concludes with a good list of publications on the British West Indies, together with information concerning the latest Blue Book Reports.

REPORT ON THE LANDS AND MINES DEPARTMENT, BRITISH GUIANA, 1908-9. Printed by the Authority of His Excellency the Governor.

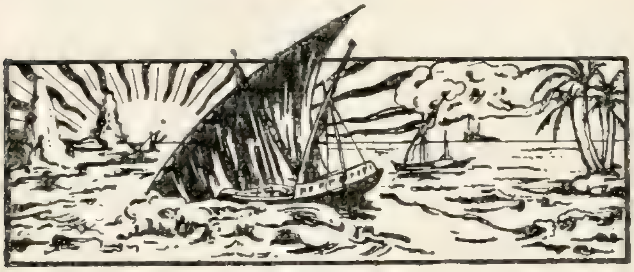
In reviewing this report, a copy of which has just been received, the chief attention will be given to the facts that are of more general interest. It shows, first of all, that the area in sugar-cane cultivation in British Guiana has decreased since the previous year, being 69,296 acres, as against 70,896 acres in 1907-8, the diminution of the area being chiefly due to the abandonment of Plantation Vergenoegen. That of rice cultivation has largely increased, and is now estimated at 37,000 acres. On the tract of 7,000 acres of land in the rear of Bartica Village, granted for experiments in the cultivation of sisal hemp, work has been pursued actively, and by the end of August of last year, 550 acres of the forest had been cleared, and stacked ready for burning, but the latter has been much impeded, owing to heavy rains; planting has also been delayed through the difficulty of obtaining material. Notwithstanding this, some 300 acres had been put in by the end of the year, and the plants are in a flourishing condition; counting on the young plants in the nurseries and others that were expected to arrive soon, it was estimated that the planting of the 500 acres would be completed by the end of the next dry season. In this area, catch crops from selected seed, some ground provisions, and on an area of 10 acres, fruit trees obtained from Florida, have been planted. As regards limes, the operations of the Demerara Development Company, Limited, at Agatash, have made steady progress. Up to November 1, 1909, 355 acres of the forest had been felled, and 308 acres of this area cleared. In this cleared land, 163½ acres had been planted in limes with 27,712 plants, and there were 138,000 seedlings in the nurseries. In addition, 650 Para rubber plants and 50 of *Sapium Jenmani* were established.

The output of timber for the year was 511,000 cubic feet; of this 191,409 cubic feet was exported, as against 232,670 cubic feet shipped last year. The amount cut included 448,223 cubic feet of greenheart and 48,546 cubic feet of crabwood. It is stated that the cutting of the latter timber is likely to become an important industry, and that several saw-mills have been erected for the purpose of turning out crabwood boards, which have been largely used instead of the imported white pine. Experiments are being carried out for the purpose of finding the best method of curing the wood, and confidence is expressed in the expectation that, when an economical and efficient means of doing this has been devised, large quantities of crabwood will be exported.

A record was made in the preceding year in the output of balata, which amounted to 981,720 lb. This was exceeded, however, during the year under report, reaching 1,100,390 lb. In connexion with this industry, it is stated that licence-holders continue to experience great difficulty in controlling adequately the operations of their labourers, and it is hoped that more stringent legislation against defaulters, and the centralization of control about to be secured by the amalgamation of the several interests, will cause an amelioration of present conditions.

The rubber industry has evoked much practical interest, and the work at the Government Experiment Stations has been pursued actively; valuable data in connexion with the yield from the native rubber tree (*Sapium Jenmani*) are about to be obtained.

In addition to this tree, Para rubber (*Hevea brasiliensis*), Lagos rubber (*Funtumia elastica*) and Central American rubber (*Castilloa elastica*) are being cultivated in the experimental fields, at the Botanic Gardens, and investigations in connexion with pruning are being carried out. The Forestry Officer has also made trials of methods of preparing rubber, with success. The proprietors of sugar estates, and others, continue to evince an interest in the cultivation of rubber-producing trees, so that several thousand seedlings of Para rubber, raised at the Botanic Gardens, have found a ready sale, while large quantities of the seed of this plant have been imported privately. There is also an increased interest in the native rubber tree (*Sapium Jenmani*), and this has been planted largely in different parts of the colony. The work of the British Guiana and Rubber Corporation is being prosecuted vigorously. The amount of rubber exported during the year was 5,751 lb.



GLEANINGS.

Experiments conducted at one of the Cuban experiment stations in raising sweet potatos from cuttings of the vine, and from pieces of the potatos themselves, have shown that plots planted according to the latter method may give a crop three and a half times as great as those planted with cuttings.

Four lectures on the Cause and Prevention of Tropical Disease have been delivered by Dr. C. W. Daniels, Director of the London School of Tropical Medicine, to employés of firms connected with the tropics. These lectures will probably be published later in pamphlet form for general information.

The amount of cotton exported from Uganda during the period April to December 31, 1909, was 1,167,376 lb., of a total value of £29,001. The similar figures for the same period of 1908 were 1,126,272 lb., and £29,559. It will thus be seen that the export of cotton from Uganda is increasing.

With reference to the information that was given in the last number of the *Agricultural News*, p. 104, in relation to the candelilla plant, it should be stated that a description of this plant and of its products is given in *Diplomatic and Consular Reports*, No. 4,215, Annual Series. In this report, the plant is described under the name *Pedilanthus pavonis.*

The usefulness of the little fish known as 'Millions' (*Girardinus poeciloides*) as a destroyer of mosquito larvae has been proved at Carriacou. It is said that since they have been introduced in that island, and placed in the swamps and ponds adjoining the town, there has been a very perceptible diminution in the numbers of mosquitos which used to render Hillsborough almost uninhabitable at certain seasons in the year. (The St. Vincent *Sentry*.)

The imports of sugar and molasses into the United States from foreign countries for the year ending December 31, 1909, reached 1,908,000 short tons, of which 1,625,000 tons came from Cuba. Practically no beet sugars were imported from Europe this season. Java was the next largest shipper of sugar to that country, sending 157,000 short tons during the year 1909. (The *Louisiana Planter and Sugar Manufacturer*, March 12, 1910.)

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, writes to say that an iguana lizard, about 3 feet 6 inches in length, has been recently captured at Cades Bay, Antigua. The animal was brought to St. John's and exhibited at the Botanic Station, for some days, as well as before the Agricultural and Commercial Society. It was subsequently liberated at Wallings. This is the first recorded instance of an iguana lizard being seen in Antigua since about 1900, when one was found in the district of which mention has just been made.

In the *Agricultural News*, Vol. VIII, p. 271, mention was made of an Indian plant, under the name of 'Dainchu' (*Sesbania aculeata*). The *Report on the Progress of Agriculture in India*, 1907-9, recently issued, makes mention of this plant under the name of 'Dhaincha', and states that, in experiments where it has been tried as a green manure, it has been found to grow vigorously and also to increase the yield of leaf in tea.

The *Annual Report on the Experimental Work of the Dharwar* [India] *Agricultural Station*, 1908-9, states that, for the improvement of Guinea corn, general selection of good sound heads has been conducted for several years on the threshing floor with very satisfactory results. The improvement of the appearance of the crop in the field, and of the returns per acre, have shown the influence of the employment of good seed, and there is a brisk demand for this on the part of cultivators.

Investigations have been recently carried out in Queensland in connexion with the supposed poisoning of cattle by means of the wild passion flower vine (*Passiflora alba*) which grows there. These have shown that poisoning does actually take place when this vine is eaten by stock, but that this action is of a cumulative nature. The discovery is of interest in connexion with the question as to whether cattle in the West Indies are poisoned by the wild ipecacuanha (*Asclepias curassavica*), to which reference has been made in the *Agricultural News*, Vol. VIII, pp. 222, 261, 363 and 415.

A preliminary forecast of the oil-seed crop of Eastern Bengal for 1909-10 has been issued by the Department of Agriculture for Eastern Bengal and Assam. This shows that the most important oil crops there are rape, sesame and linseed, while castor and other oil seeds are also grown. It appears that the season has been a favourable one, so far, on the whole, for all these crops, and increases in yield from the areas planted are expected. The area sown in rape is estimated to be 1,234,500 acres, as compared with 1,195,300 acres in the previous season; the similar figures for linseed are 85,100 and 86,000 acres.

Enquiry has been made of the Department as to where threshing machines for ground nuts may be obtained. For general information, it may be stated that the Ellis Champion Grain and Pea nut Thresher, sold by George C. Burgess, P.O. Box 182, Petersburg, Va., U.S.A., appears to be useful for the purpose. It is claimed that this machine separates the nuts from the vine on the same principle as grain is threshed from straw, and that the nuts come from the machine cleaned, ready for market, while the vines are broken up and put into condition for feeding purposes. The machines are made in three sizes, which require engines of 4 h.p., 6 h.p., and 8 h.p. to drive them.

With reference to the statement in the article entitled 'Implemental Tillage for St. Vincent', which appeared on page 3 of the current volume of the *Agricultural News*, and which contained the chief matters in the report made by Mr. G. Fraser, Agricultural Instructor, St. Vincent, on his visit to Antigua in connexion with the subject, Mr. I. E. Dyett, of Fitches Creek Estate, Antigua, has kindly pointed out that the statement in paragraph 4 of that article: 'For cane planting a shallow trench is run along the top of the banks by means of a double mould-board plough' is not quite accurate, for the furrow in question always runs as deep as the water furrow, and often reaches a depth of 12 to 14 inches.

STUDENTS' CORNER.

APRIL.

SECOND PERIOD.

Seasonal Notes.

A careful examination of old cotton should be made for the purpose of finding out what pests are attacking it, and the extent of the attack in the case of each. One of the most easily seen among these is the black scale, which is often present to a large degree. Careful observations on the covering of these scales will reveal the presence of a small hole in it, and on separating the scale from the branch, it will be seen that, instead of the soft tissue of an insect, a small quantity of dried remains is present. This means that the scale insect has been attacked by a parasite which, after feeding upon it and causing its death, escaped through the hole that is seen in the covering. Further observations in connexion with this matter may be made in the following way. A freshly-plucked branch on which living scale insects are present is placed in a bottle or jar which has been cleaned and dried carefully; the bottle or jar is then closed by means of a piece of thin calico, which is placed over its mouth and tied by a string passing round the neck. After a day or two, at least two different kinds of small flying insects will probably be seen on the inner surface of the vessel. Although these are very small as compared with the most commonly observed insects, they are plainly different in size. The larger one is the male of the scale insect, while the smaller one is the adult stage (imago) of the parasite. What is the importance of this, and similar parasites, to the agriculturist? What would you expect to be the result, in relation to scale insect attack, if conditions arose which caused a large reduction in the numbers of the parasite? What facts, in relation to the advisability of destroying scale insects in a wholesale manner, does the consideration of the work of such parasites suggest?

Scale insects do not only find enemies in certain other insects; they are preyed upon to a useful extent by fungi which grow into their soft tissues, under the covering scale, and cause their death. From their importance in providing a means for controlling such insects, these fungi have become of great interest, and all who are concerned with agricultural subjects should make careful observations on them and send the results of these to the Department of Agriculture in the island in which they live, being very careful to forward, at the same time, the material on which their observations have been made. Such work will be of the greatest value to agriculturists, and of assistance to their advisers. For information in connexion with this subject, see *Agricultural News*, Vol. II, pp. 216 and 232; Vol. V, p. 42; Vol. VIII, pp. 186, 202, 299 and 411.

Provide yourself with information concerning other methods of control of scale insects, paying special attention to Bengal beans in this connexion. While these matters, in relation to scale insects and fungi, are under discussion, a useful opportunity will be given for considering the relation between such insects and black blight. (See *Agricultural News*, Vol. VII, p. 161.)

As the Easter crop of cacao is now being gathered, it will be expedient to make an examination, where different varieties are grown, for the purpose of determining the chief useful characteristics of these. In doing this, the following points will be mainly considered: vigour of growth; yield of pods; number of beans in each pod; resistance to disease; power to recover from disease after having been treated for it. What measures are employed in cacao plantations against wood ants and rats, respectively?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give, shortly, as many uses of the soil to plants as you can.

(2) State definitely what is meant by plant food. What are the chief kinds of plant food?

(3) Why is it that, although soils contain enough plant food to grow many crops, it is necessary to apply manure if a reasonable yield is to be obtained?

INTERMEDIATE QUESTIONS.

(1) Describe the root borer of the sugar-cane, and its method of attacking that plant.

(2) What changes are likely to occur in farmyard manure, on storage? How are these changes affected by the conditions under which the storage takes place?

(3) Give an account of the chief methods that are employed in the breeding of corn (maize) for improvement in yield.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated April 1, 1910, gives information as follows:—

The weather during the fortnight has been fairly dry, and reaping of short crop has been progressing favourably.

Deliveries of rice to town have been steady, and prices have remained firm.

Shipments to the West Indian islands during the fortnight amounted to 5,079 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 16*s.* 9*d.* to 17*s.* 9*d.* per bag of 180 lb. gross.
15*s.* 9*d.* to 16*s.* 9*d.* ,, ,, ,, 164 lb. ,,

Kafir Bread.— In far-off South Africa, in the land of the Kafir and the Zulu, is found a group of plants, belonging to the Cycas family, known to the botanist as *Encephalartos*—a name derived from the Greek and meaning 'bread within the head', alluding to the farinaceous pith within the stem of these plants, which is used as a food by the natives of that region. They are said to bury the stems in the ground and allow them to remain there for several months; the mucilaginous centre is then taken out and dried, and made into cakes like bread. On account of this use of it for food the name of 'Kafir-bread' has been bestowed upon the plants, and especially upon that species known as *Encephalartos caffer*. The name 'Kafir', meaning an unbeliever, was applied by the Mohammedans of Eastern Africa to the negroes of that region because of their refusal to accept the faith of Mohammed. Besides the living species, one fossil species is known.

The Kafir bread plants, of which there are about twelve species, are found only in Africa, mainly in the southern parts, with one or two species extending into the tropical portions. They finally develop a long, stout cylindrical stem sometimes 6 to 10 feet tall, though in a young state this is in the form of a hemispherical body—a condition in which they are usually found in cultivation, for they are of very slow growth and require years to attain any size. From the apex of the stem arises a crown of pinnate leaves, in some species forming objects of great beauty and decorative value. (*Journal of the New York Botanic Garden*, Vol. X, No. 120.)

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part IV.

The Ascomycetes. The next group of fungi to be considered is the Ascomycetes. These fungi all possess a mycelium which is divided up by transverse walls, and they are characterized by the formation of a sac, or ascus, in which a definite number of spores, usually eight, is borne. The whole group may roughly be divided up into the following sub-groups:—

Protoascineae.
Protodiscineae.
Helvellineae.
Discomycetes.
Tuberineae.
Plectascineae.
Pyrenomycetes.

This division is a more or less rough one, and in fact, there are so many classifications of the Ascomycetes on different lines that it is a matter of some difficulty to choose between them.

As has been stated previously, the bulk of the evidence which has accumulated during recent years would tend to show that the asci were originally formed as the outcome of a sexual process. In some genera, an organ correspond to the oogonium of the Oomycetes, and another similar to the antheridium in the same group, have been found to exist, and in some cases an actual fertilization process is known to occur. In many genera, however, the process has become obsolete, or modified in one way or another, so that it differs considerably from its original form. The scope of this article does not permit of a further discussion of this question, which is one of very great complexity.

Fig. 21. Sclerotinia fuckeliana. (Apothecia open.)

The protoascineae and protodiscineae. In these groups, the asci are produced over the whole mycelium, or sometimes from a special part of it, but are not enclosed in a particular form of covering, consequently there is no very definite fruit-body by which the members of the groups can be recognized, as the asci are in most cases borne free on the surface of the host-plant. These fungi often cause various malformations of the host, such as witches' brooms of many trees, especially in the temperate zone, leaf curl, leaf blisters, and malformations of fruits, with which the genera *Exoascus* and *Taphrina* are so frequently associated. The asci are usually short and more or less cylindrical. They are produced from hyphae growing in the outermost wall of the epidermis of the host, known as the cuticle. They grow out at right angles to the surface of the host, bursting the cuticle as they develop. The fungi known as yeasts belong to the first of these groups.

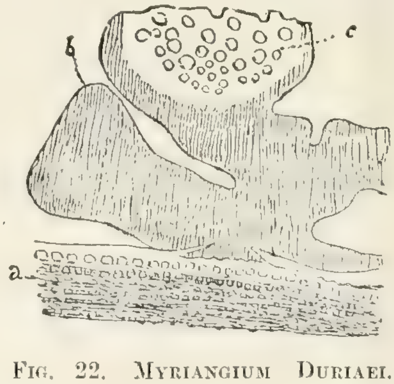


Fig. 22. Myriangium Duriaei. (a) Tissues of Host, (b) Stroma of Fungus, (c) Tissue Producing Asci.

In all the other members of the Ascomycetes, the asci are borne on definite fructifications, either open when ripe, so that the asci are freely exposed to the air (*apothecia*), or in the form of closed, often spherical, masses, which decay and so liberate the spores (*cleistothecia*), or in boxes with some definite method of opening by means of a lid or a pore at the top (*perithecia*). Both the apothecia and perithecia are often carried on some form of stalk or supporting arrangement built up from the hyphae of the fungus, or, in some cases, are borne on, or sunken in, a special mass of closely woven hyphae known as a stroma. In other cases, the fructifications are originally sunken in the host plant and only break out on the surface when ripe or nearly so.

The helvellineae. In this group, the fructifications are usually erect and fleshy, though they may be of various forms. They are generally lobed, or wrinkled, and bear the asci all over their upper surfaces. Some of the species are edible, as for instance, some in the genus *Morchella* (morel). Others are suspected of being parasites.

The discomycetes. This group of fungi is characterized by having its asci produced in fructifications known as apothecia, mentioned above. The fructifications are more or less cup-shaped when ripe, and either borne on a stalk of sterile interwoven hyphae, or are sessile on the underlying substance (substratum); the asci are borne over the whole of the hollow upper surface, and at right angles to it. Between the asci are numerous free hyphae, often somewhat swollen at the end. These are known as hairs, or paraphyses. The asci and paraphyses often give the inner surface of the cup a smooth or somewhat gelatinous appearance. When young, the apothecia are closed, and consist of an outer covering layer of closely woven, sterile hyphae, from which the paraphyses spring, and an inner layer of special hyphae from which the asci are produced. The fructifications, when young, may be immersed in the substratum, but become free when ripe, and open out to form the cup-shaped structure already described. The group is further subdivided by the characters of the apothecia—whether immersed in the substratum when young, or free from the start; whether sessile or stalked, black or coloured, and similar points. The spores are usually forcibly extruded from the asci by the mutual pressure of the asci and paraphyses. They may be of different shapes, from oval to linear, one- or more-celled, colourless or coloured, transparent or opaque; and such characters serve to differentiate genera and species. This group does not contain any parasites very well known in the West Indies; Fig. 21 shows the stalked apothecium of *Sclerotinia fuckeliana* with the hollow cup at the top. The apothecia have grown out from a hard mass of fungus mycelium known as a *sclerotium*.

The tuberineae. The fructifications are closed, or nearly so, and consist of a more or less solid mass of tissue, often penetrated by channels in which the asci are produced. The spores are liberated by the rotting of the ascus. The channels in the closed fruits often lead in the direction of a portion of the surface, only covered by a very thin layer of tissue, which breaks down and liberates the spores. In some cases, the fructifications are open entirely; in others, very thick layers surround the whole cleistothecium. These characters serve to subdivide the group. The asci are usually only 4-spored, and the spores are often spiny. All the fructifications are borne under ground, some of them being edible and known as truffles.

The plectascineae. In this group, the fructification is again a cleistothecium, very minute in size, and consisting of a mass of tissue, in which are hollows where the asci are

produced; each ascus is often separated from the others by a mass of soft tissue, or the asci are formed in irregular lines. The fructification may be of a fairly soft, fleshy consistency, and coloured, or black and hard outside, though softer and colourless within. This group includes the black fungus parasitic on scale insects (*Myriangium Duriaei*), and the genus *Meliola*, one of the black blight fungi. Fig. 22 shows part of the stroma and fructification of *Myriangium Duriaei*, as seen in longitudinal section: (a) represents the tissue of the branch on which the fungus is growing; (b) the black, hard stroma; (c) the transparent white tissue from which the asci—whose position is represented by the circular spaces—are produced.

The PYRENOMYCETES. Here the fructifications are perithecia, or hollow boxes, in which the asci and paraphyses are produced. They may be superficial, or immersed in the substratum, borne simply on, or in, a stroma; they may be of different colours and different consistency. The asci usually contain eight spores, which are unicellular or multicellular, coloured or colourless, and of many different shapes. All these characters are of value in subdividing the groups. For instance, in the Perisporiales, the perithecia open with a lid, or simply decay. In the Hypocreales, Sphaeriales and Dothideales the spores are extruded, when ripe, through a pore at the top of the perithecium.

In the Hypocreales, the perithecia, and stroma when present, are fleshy and coloured. In the Sphaeriales, they are black and hard, either scattered and superficial, or grouped in a stroma. In the Dothideales, the perithecia are simply hollow spaces in the black stroma. To these groups belong many common parasites in these islands. For example, the various species of *Nectria* causing diseases of cacao belong to the Hypocreales. The fungus causing rind disease of the sugar-cane, *Trichosphaeria sacchari*, is a member of the Sphaeriales; *Sphaerostilbe coccophila*, the red-headed fungus, and *Ophionectria coccicola*, the white-headed fungus of scale insects, are included in the Hypocreales, and there are several other examples.

In the *Agricultural News*, Vol. VIII, p. 200, a figure is given of *Sphaerostilbe flavidum*, a typical member of the Hypocreales. In this plate, Fig. 5 represents a cluster of the perithecia of the fungus, with the conidial form of fruit as well. The perithecia are shown further magnified in Fig 6. They are bright-red in colour, while the conidial fruits are yellow and semi-transparent. Fig. 7 shows an ascus with eight bicellular ascospores.

This concludes the discussion of the different groups of the Ascomycetes. Some further remarks on the other spore forms found among them will appear in the next number of the *Agricultural News*.

CARE OF MINOR ARTICLES USED ON ESTATES.

The Bureau of Plant Industry of the United States Department of Agriculture has just issued a circular (No. 44) entitled *Minor Articles of Farm Equipment*. Although the conditions for which it was written are different from those in the West Indies, several of the points dealt with in it are important in relation to general agricultural practice, and these have been extracted, in view of their interest and suggestiveness.

Among the losses in farming to which, because of their apparent unimportance, little attention has been directed, is the waste which occurs through a general lack of comprehension as to the extent and value of the minor articles which are necessary to the smooth running of a farm. This waste is exhibited in extra expense through the purchase of unnecessary tools and materials; in the loss of time and discounts in buying numerous articles, singly or in small lots; in the loss, theft, and rapid depreciation of items of equipment considered too insignificant to require systematic care; and in the losses in many directions, through the lack, or the misplacement, of equipment at times when it is urgently needed.

The total cost of the miscellaneous articles is usually much higher than the estimates given by farmers and writers on agricultural subjects, but owing to the great number of small purchases made, this fact is seldom realized except by the few who have made careful inventories at stated intervals. Ignorance of this leads farmers in general to neglect an extremely valuable portion of their equipment, and it would probably be found that the decrease in value of the small articles is much more rapid than that of the major items, for which an annual rate of depreciation of 7·3 per cent. has been established. The low estimates regarding this part of the equipment also prove disappointing to the manager of a new farming venture, who finds it necessary to make an increased outlay on this account, attended by a readjustment of his plans.

The importance of having a good working equipment in small articles, and the absolute necessity of caring for it, are matters which should be apparent to the thoughtful farmer and need not be dwelt upon further. The waste of time in making numerous special trips for small articles is also apparent, particularly when it is considered that many of these occur in the busiest seasons. This could be avoided to a large extent by taking an inventory during a slack period, and replacing all missing items at the first opportunity.

The nature of the minor equipment will be determined largely by the character of the farm enterprises, and by the proximity of repair and shopping facilities; while its extent may be governed by the size of the farm, the number of workmen, and the financial circumstances of the proprietor. Perhaps both the nature and the extent of the minor equipment will be influenced most by the farmer's attitude in regard to small economies, and by his ability to use tools to the best advantage.

To the owner of a farm who has had no occasion from time to time to collect his miscellaneous equipment and to take account of its extent, the advisability is suggested of taking an annual inventory of the small, as well as of the large, equipment, in order to keep track of his investment. The practice of taking an annual inventory, even of the larger pieces of machinery, is not as common as it should be, and in many cases where an invoice is taken, the 'small stuff' is lumped in one item. During the process of taking the inventories used in compiling this circular, the owner almost invariably expressed astonishment at the extent to which his capital was invested in miscellaneous minor articles.

To sum up, few farmers realize the extent of their investment in small items of equipment, or the time and inconvenience involved in buying numerous articles, singly or in small lots. Before planning the farm equipment, due consideration should be given to the necessary outlay for minor items and, where possible, the latter should be secured at one purchase, thereby saving time and, usually, money. The purchase of these articles in such a manner will mean a total expenditure sufficient to impress the farmer with the need for their systematic care.

MARKET REPORTS.

London,—The West India Committee Circular, March 29, 1910; Messrs. E. A. de Pass & Co., March 18, 1910.

Arrowroot—St. Vincent, 1⅞*d.* to 2¾*d.*
Balata—Sheet, 3/3; block, 3/- per lb.
Bees-wax—£7 10*s.* to £7 17*s.* 6*d.*
Cacao—Trinidad, 53/6 to 63/- per cwt.; Grenada, 50/- to 55/6 per cwt.; Jamaica, 48/- to 53/6.
Coffee—Jamaica, 41/- to 54/6.
Copra—West Indian, £27 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; St. Croix West Indian, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
Honey—24/- to 25/-.
Isinglass—No quotations.
Lime Juice—Raw, 10*d.* to 1/-; concentrated, £18 15*s.* to £18 17*s.* 6*d.*; Otto of limes, 5/9.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
Rubber—Para, fine hard, 10/5, fine soft, 10/5; fine Peru, 10/3 per lb.
Rum—Jamaica, 2/3 to 5/-.
Sugar—Crystals, 19/- to 20/3; Muscovado, 15/- to 16/3; Syrup, 14/- to 16/6; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., March 18, 1910.

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11¾c. to 12c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 10¼c. to 11½c. per lb.
Cocoa-nuts—Jamaica, select, \$30·00 to \$32·00; culls, \$18·00; Trinidad, select, \$28·00 to \$30·00; culls, \$18·00 per M.
Coffee—Jamaica, ordinary, 9c. to 9½c.; good ordinary, 9½c. to 10c.; and washed, up to 11½c. per lb.
Ginger—9½c. to 13c. per lb.
Goat Skins—Jamaica, 52c.; Barbados, 45c. to 47c.; St. Thomas, St. Croix, St. Kitts, 42c. to 43c. per lb.; Antigua, 45c. to 47c., dry flint.
Grape Fruit—\$2·25 to \$3·50 per box.
Limes—\$6·00 to \$7·00.
Mace—32c. to 36c. per lb.
Nutmegs—110's, 9¼c. per lb.
Oranges—Jamaica, \$1·00.
Pimento—4⅛c. per lb.
Sugar—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., April 2, 1910.

Cacao—Venezuelan, \$12·15 per fanega; Trinidad, \$11·90 to \$12·15.
Cocoa-nut Oil—93c. per Imperial gallon.
Coffee—Venezuelan, 10¾c. per lb.
Copra—\$4·40 per 100 lb.
Dhal—\$4·40 per 2-bushel bag.
Onions—\$3·25 to \$3·50 per 100 lb.
Peas, Split—\$6·75 to \$7·00 per bag.
Potatos—English, \$1·00 to \$1·50 per 100 lb.
Rice—Yellow, \$4·50 to \$4·60; White, \$5·00 to \$5·10 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., April 11, 1910; Messrs. T. S. Garraway & Co., April 11, 1910; Messrs. James A. Lynch & Co., April 4, 1910.

Arrowroot—St. Vincent, \$3·40 to \$3·75 per 100 lb.
Cacao—\$11·00 to \$12·50 per 100 lb.
Cocoa-nuts—\$14·00.
Coffee—Jamaica and ordinary Rio, \$10·00 to \$11·00 per 100 lb., scarce.
Hay—\$1·20 to \$1·25 per 100 lb., dull.
Manures—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
Molasses—No quotations.
Onions—Bunched, \$2·00 to \$3·50 per 100 lb.
Peas, Split—\$6·20 to \$6·75 per bag of 210 lb.; Canada, \$3·45 to \$3·60 per bag of 120 lb.
Potatos—Nova Scotia, \$2·40 to \$2·90 per 160 lb.
Rice—Ballam, \$4·33 to \$4·60 (180 lb.); Patna, \$3·80; Rangoon, \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, April 2, 1910; Messrs. Sandbach, Parker & Co., April 1, 1910.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$8·00 to \$8·25 per 200 lb.	\$8·00 to \$8·25 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
Cacao—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	\$6·00 per barrel of 196 lb.	No quotation
Cocoa-nuts—	\$12 to \$16 per M.	\$16 per M., peeled and selected
Coffee—Creole	12c. to 13c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	14c. to 14½c. per lb.	14½c. to 15c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	\$4·25 to \$4·50 per bag of 168 lb.	\$4·50 to \$4·65 per bag of 168 lb.
Green Dhal	\$5·75	——
Eddos—	\$1·44 per barrel	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	No quotation
Madeira	—	No quotation
Peas—Split	\$6·45 to \$6·50 per bag (210 lb.)	\$6·50 per bag (210 lb.)
Marseilles	\$3·50	\$3·50 to \$4·25
Plantains—	20c. to 60c. per bunch	——
Potatos—Nova Scotia	\$2·25	\$2·25
Lisbon	No quotation	No quotation
Potatos—Sweet, Barbados	\$1·32 per bag	——
Rice—Ballam	No quotation	\$4·75
Creole	\$4·00 to \$4·20	\$3·70 to \$4·00
Tannias—	\$1·80 per bag	——
Yams—White	\$2·28	——
Buck	\$2·28 per bag	——
Sugar—Dark crystals	\$3·10 to \$3·15	None
Yellow	\$3·60 to \$3·70	\$3·70
White	\$4·00	\$3·80 to \$4·00
Molasses	\$2·50	None
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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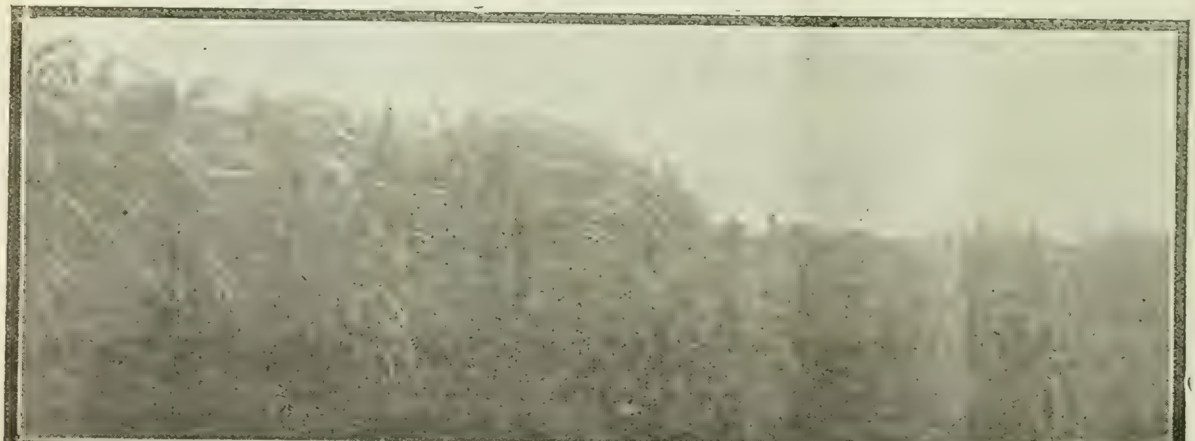

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CONTENTS.

The Functions of Agricultural Experiment Stations.

I. In Stimulating Research.

THE nature of the work that is carried on in agricultural experiment stations necessitates the existence of a large degree of routine. This is brought into being chiefly by the constantly recurring matters that relate to the crops most commonly grown, such as sugar, cotton, cacao and limes, during each season in which they are receiving attention, in order that they may give their produce in a successful manner. There is a seasonal cycle of activities that claims a large amount of the time at the disposal of those who are responsible for the conduct of the work of the experiment station.

This side of the activity of the station is naturally of great importance. It is the one which enables it to keep most closely in touch with those for whom it exists, and, too often, it is the sole criterion by which the existence of the station is justified. This fact, aided by the circumstance that such work is continually in evidence, and constantly demands attention, constitutes a source of danger to the efficiency of the labours of those who are engaged there. Routine may demand so much attention that there is no time left for research.

Two practical meanings may be attached to the word Research. It may be employed for the purpose of giving the idea of *careful search*, or it may, as its form indicates, connote *searching again*. Both these aspects of it are before the scientific investigator and, it may be added, the second is the more often present with the agriculturist, chiefly because the practice of agriculture is so ancient that many of its problems have been worked out empirically, long ago. What is wanted is the reason why these problems can be solved in the way that has been found, in order that such a knowledge of them may be obtained as to enable modifications to be suggested that will improve old methods and make these applicable, with the necessary changes, to new conditions.

In answering certain kinds of agricultural questions, routine and research approach one another in such a way that one becomes part of the other. This

is especially the case where work is entailed that will spread over many seasons, such as, for example, the production of seedling canes, work on Mendelian lines, or the making of manurial experiments. The last forms an instance in which efforts are being made to reach definite conclusions as to agricultural procedure, while in the first case the purpose is to produce actual material that will be used in a definite, practical way.

In other kinds of research, the work connected with the question under consideration is not of indefinite duration. First among these may be mentioned the kind which relates to new agricultural problems; that is to say problems taking their origin from the discovery of new facts. Here, an explanation of the facts is not the only matter of importance. A knowledge is required of the best way to apply them to existing conditions, and the attainment of the first will lead to the realization of the second.

New problems should not be permitted to minimize the importance of those that are already awaiting solution. In reality, the latter are of the more momentous nature, and it is very probable that their solution will lead to the disappearance of many of the new ones that were supposed to have a real existence. To be carried away from the more exigent matters by the charm of novelty will not lead to the attainment of the most useful conclusions.

Among the problems awaiting solution are those which relate to the discovery of explanations of well-known facts; brief reference to these has been made already. The investigations conducted during recent years have afforded several examples of the making of such discoveries. The enrichment of land by growing leguminous crops has been an agricultural practice, in many parts of the world, for centuries; only recently has the explanation been provided of the way in which the improvement takes place. Partial sterilization of the soil, by substances which put an end to life, by heat, or by the direct rays of the sun, has long been known to cause it to give larger yields of the crops grown upon it, but it is only now that investigators are able to speak with any degree of certainty as to the changes that have led to the increased fertility. The long employed agricultural practice that age has made a custom has already, in many cases, gained the respect of the agricultural adviser and, with the aid of his discoveries, has shown the way to the adoption and modification of agricultural operations, so that the position of those who exist by means of them has been materially improved.

The last kind of research that may be considered derives its importance from the application of its results over the areas to which these have particular relation. Its conclusions are of local moment, merely; though they may depend upon the special application of a general fact, they are not, themselves, of widespread value. They are none the less of use to the practical agriculturist, under the special circumstances, though their limitations should be clearly indicated, in order that they may not be employed under conditions on which they have no bearing.

This description of the different kinds of research to which an experiment station may give its attention should, incidentally, have demonstrated sufficiently the necessity of its existence wherever such stations are found. There are, however, other equally cogent reasons that have their origin in a consideration of the internal characteristics of the station. Firstly, there is the indirect effect of research, even though it may be purely academic, on the mind of the worker, whereby the clearness of his mental impressions in regard to ordinary problems is improved, and through which he gains confidence in his work and in the interpretation of its results. Secondly, if the best kind of investigator is to be attracted to experiment stations, he must be given the opportunity to engage in research. Lastly, the efforts connected with research, especially that of a more academic kind, act as a stimulus, both to the worker and his associates, and prevent their labours from being confined and limited in such a way as to deprive them of the lively interest without which they will speedily lose their value. It is necessary that the plan and purpose of the investigations should be definite; that the problems taken up should not be of too large or broad a nature; and that the number of lines of work should be carefully limited.

The investigators at an experiment station, then, must realize that they are indebted to agricultural science and to agricultural education, and that it is part of their duty to contribute to the needs of all phases of agriculture, in a broad sense, by accompanying the research of a more obvious nature with that which is of an academic character. They will thus be influenced to take up lines of work such as may be discontinued if occasion demands, and will receive in return that stimulus which will impart a living interest to their labours.

SUGAR INDUSTRY.

SEEDLING SUGAR-CANES IN LOUISIANA.

The following particulars of the work of obtaining seedling canes that had been done in Louisiana, up to the end of 1908, are taken from an account given by the Director of the Experiment Stations of the Louisiana State University, in Vol. V of the reports issued by the American Breeders' Association :—

Shortly after the Louisiana sugar station was established, Harrison and Bovell succeeded in germinating cane seeds in the West India Islands. Reports of their work have been given before this association. Cuttings were obtained from all the promising variations secured by these two botanists, and plantings were made at the Louisiana sugar station at New Orleans. Two of the seedlings will be referred to later.

The success attained in germinating the seeds encouraged Dr. Stubbs to try to germinate cane seed, with the hope that a seedling would be obtained that would be very fully acclimatized to Louisiana conditions. These efforts were uniformly unsuccessful. After a number of failures in an effort to germinate seed, Dr. Stubbs concluded that possibly the seeds were too old, or had been damaged by conditions under which they were transported from the point of origin to Louisiana. So he began trying to produce a mature cane that would tassel and make seed, by protecting the canes during the winter—thus giving them an extended period of growth.

With the co-operation of the Audubon Park Commission, a considerable quantity of cane was grown in the horticultural hall and protected from the fluctuations of the season, and thereby kept growing continuously. These canes grew for several years, and became so tall that they had to be artificially propped up, but they never came into flower.

To return to the production of seedlings, the Louisiana station took up the subject again in 1907, and secured the germination of a few seeds.

In the meanwhile, however, attention had been turned to the arrows or tassels of the cane stalk, and about 1887 Harrison and Bovell, in Demerara, succeeded in growing plants from the seed of the cane which had been hitherto thought unfertile. This was the beginning of a great work, that has since meant much to the industry. In these seedlings there is an extreme variation in size, colour, sugar-content and general habits of growth. Out of a thousand seedlings, there will be only a few that will show properties superior to the mother cane. Among the first canes, propagated in this manner, which obtained prominence were the Demerara 74 and Demerara 95 of Messrs. Harrison and Bovell. These canes are grown extensively in Demerara, and have proved, on introduction to Louisiana, to be especially fitted for the short growing season, where an early maturing cane is necessary. The acreage of the D. 74, particularly, is being extensively increased, and the cane is thought of very highly by most of the planters of the State. Some planters have observed that the fact of having a large acreage in this cane has meant, in certain adverse seasons, the difference of a profit or loss on the crop.

It was not until 1907 that we were able to germinate cane seed. This was the first time that cane plants were produced from seed without the tropics.

In the first year the growth is always dwarfed and the sugar content low, and the plants present no indication whatever as to what they will ultimately do. These are harvested, and the entire length of the stalk is planted, as is ordinarily practised in the industry. From these, full-sized canes are produced, and it is interesting to note the wide variation in colour, size, sucrose content and manner of growth.

There is enough of each cane the second year for analysis, and some idea can be got as to which are the more desirable of the seedlings. The third year's results must be awaited, however, for conclusive evidence and data as to tonnage.

In 1907, the first year of seedling propagation in Louisiana, eighty-five plants were produced. These came from the seed of the following varieties :—

4	from Demerara No. 1,132	14	from Demerara No. 117
2	,, White Mexican	1	,, Lahaina
31	,, Hawaii No. 28	2	,, Kokea
29	,, Hawaii No. 83		

These seedlings are given arbitrary numbers and will be termed, Louisiana No. 1, Louisiana No. 2, etc, for convenience in identification. All the stalks were planted in the fall of 1907, and nearly all produced vigorous growing canes for the crop of 1908. These results, from the general appearance of the cane and the analyses of the individual stalks, are such as to be extremely encouraging for a continuance of this work, and each of the newly produced varieties has been planted in sufficient quantity so that full data can be obtained this coming crop. It is not safe to say, at this time, if any of these canes are superior to those at present grown on the plantations, but in respect to one or two, viz: L.92 and L.100, indications are to that effect. L.92 gave over 1 per cent. more sucrose than canes of the standard varieties grown on the same plot. L 100 promises to be a cane of average sucrose content and extremely heavy tonnage. Individual stalks of this cane weighed 7 or 8 tb. (the weight of an average stalk of cane is $2\frac{1}{2}$ to 3 tb.).

We were more successful in 1908, and succeeded in growing about 500 seedlings. These were from seed of the following varieties :—

Demerara 95	Trinidad 76	Barbados 208	Hawaii 9
,, 74	,, 83	,, 3,390	,, 66
	,, 105	,, 3,396	,, 70
	,, 171	,, 3,747	,, 139
	,, 189	,, 3,819	,, 140
	,, 204	,, 6,048	,, 13
		,, 7,627	

It will be interesting to get results from the D. 74 seedlings, as that cane has reached such prominence under Louisiana conditions. These seedlings were planted in the open field, earlier than the crop of the previous year, and as a result, gave hardier stalks with a higher sucrose content. However, as stated above, cane seedlings are always dwarfed and imperfect. At the present time, the third crop of seedling canes is being germinated, and gives promise of greater success than previous ones; a large assortment of seed has been obtained from Trinidad, Cuba, Jamaica, Hawaii, Porto Rico, Antigua and other places.

The *West India Committee Circular* for March 29, gives an account of experiments that have been conducted at the Royal Agricultural College, Cirencester, for the purpose of testing Molascuit with regard to its value as a milk producer in cows, ground oats being used for the purpose of comparison. The trials showed that the yield of milk, the production of butter-fat and the flavour of the butter were affected little by the kind of food given, and that Molascuit gave as good results, in the matter of fat production, as ground oats, at a smaller cost.

WEST INDIAN FRUIT.

THE GEOGRAPHICAL DISTRIBUTION OF THE COCOA-NUT PALM.

The following information concerning the geographical distribution of the cocoa-nut palm is taken from an article in *L'Agriculture Pratique des Pays Chauds* for January 1910:—

The cocoa-nut palm belongs to the tropical zone. Its place of origin has been fixed by de Candolle to be the Malay Archipelago. On account of the numerous uses that can be made of it, its cultivation has received attention for a very long time and its habitat has extended into many different regions in which the climate and soil are suited to it. This is exemplified by the fact that plantations of this palm have been made to a very large extent on the south coast of the continent of Asia, as well as in the neighbouring islands.

At the present time, Ceylon appears to be the country which possesses the largest areas devoted to its cultivation, and it is there that the greatest use of its produce is made. Here, too, the industries that are concerned with the preparation of the products that are obtained from it have reached a very high degree of perfection, so much so that it does not appear to have been surpassed by that in any other region. In British India this palm occupies an area that is of relative importance, but one which is nevertheless insufficient to supply the requirements of local consumption. Certain places are noted for the quality of the copra that they produce; this is the case with Travancore and chiefly in the region of Cochin-China, on the south-west coast.

The plant is found to a fair degree in the French settlements in India, but the extent is so small that the output of the plantations is not a matter of commercial importance; in fact, a large quantity of the produce is consumed where it is grown. A small amount of copra is made in the territory of Mahé, and a little oil in the neighbourhood of Karikal. Besides this, since 1903, a factory for cocoa-nut butter (cocotine) has been erected at Pondicherry.

Singapore is a centre from which large quantities of copra are exported. Cocoa-nut palms are abundant in the British Settlements on the Malacca Straits, especially around Singapore and Poulo-Penang. But as a matter of fact these settlements are large commercial centres, through which pass enormous quantities of colonial produce. The copra exported from Singapore comes chiefly from Dutch Borneo, from Bali and from the Natuna and Anambas Islands. Numerous cocoa-nut palms exist in the French possessions in Indo-China, especially in Cochin-China. The Philippine Islands form a very important centre for the production of copra. In the Dutch East Indies, the cocoa-nut palm occupies an important position on account of the natural fertility of the soil; its growth there is rapid, and it is cultivated with little expense.

In the groups of islands scattered throughout that part of the Pacific ocean which lies in the tropics, the cocoa-nut palm is generally abundant. Here, near the sea, it forms veritable forests. This is the case to a notable extent in the Samoa Islands, where the greatest care is taken, on the estates under the management of Europeans, to obtain a copra of excellent quality. In New Caledonia, the cocoa-nut palms form a long belt on the east coast, between Canala and Hienghène. The copra which is produced is sold to a large extent in the markets of Sydney. In the same way, the Loyalty Islands produce a large quantity of copra, and the New Hebrides are suited particularly well for the growing of the palm. In the archipelago of Tahiti, cocoa-nut plantations occupy about two-thirds of the cultivated land. The atolls of Tuamotou have only been habitable since the cocoa-nut tree has been introduced there.

As far as South and Central America and the West Indies are concerned, the total area of cocoa-nut plantations is very large. The products of these find their chief outlet toward the United States, where considerable quantities of nuts and copra are dealt with. The palm is especially abundant in the North of South America, in Venezuela, in Brazil and in the Guianas, in the different states of Central America, in the Bahamas, in many of the Antilles, notably Jamaica and Trinidad. In the last-named island, the manufacture of cocoa-nut oil on a large scale by means of improved methods seems likely to attain a certain development. Although the cultivation of the cocoa-nut palm meets with the same success in the French West Indies as is obtained in the neighbouring countries in which it occupies a large place, it has extended there but little, and, except in the case of Guadeloupe, its products are absorbed by local consumption.

So far, there are few cocoa-nut plantations on the tropical coasts of Africa, but it has been shown, as a matter of fact, that there is a very marked movement in favour of their establishment, on the west as well as on the east coast. In the Islands of the Indian Ocean adjacent to the continent of Africa, cocoa-nut palms are generally numerous, especially in the islands of Zanzibar, Pemba and in the Seychelles, the

cocoa-nuts from which have an excellent reputation. At one time, they were equally abundant in the Comoro Islands, but for several reasons, their number has sensibly diminished and the export is very small. In Réunion the cocoa-nut only exists in small cultivations, and as isolated specimens scattered in gardens: all its produce is consumed locally. The palm seems to have been introduced into Madagascar at a fairly remote time. Prudhomme estimates that it would be difficult to find more than twenty or twenty-five thousand trees in the island. All the nuts collected are consumed locally. The administration of Madagascar has made very great efforts to assist in the development of plantations of cocoa-nut palms.

According to Ferguson, the world's cultivation of cocoa-nuts covers an area of about 2,800,000 acres, divided as follows:—

Ceylon	708,175 (about one quarter)
South America	500,000
British India	352,500
Malay States, Philippines, Straits Settlements	302,500
Java and Sumatra	252,920
Central America	250,000
Pacific Islands	250,000
East Africa	111,285
Siam and Cochin-China	101,168
West Indies	10,000

THE CONGO COFFEE PLANT.

Information regarding the Congo coffee plant (*Coffea robusta*) is given in Bulletin No. 7 of the Department of Agriculture, Federated Malay States. As part of this is of more general interest, it is extracted below.

Coffea robusta was discovered wild in the Congo region by Emil Laurent in 1898. The plant was taken up commercially by a Brussels Horticultural firm and named *Coffea robusta* by them.

C. robusta differs in many ways from the well-known *C. liberica*. The habit is somewhat different. It grows more rapidly. An eight-months-old plant is much larger and has more branches and leaves than a Liberian one-year-old. The branches of *C. robusta* are longer and have a tendency to bend down towards the ground, so that the bush is rather umbrella-shaped. Gormandizers and suckers are fewer than on *C. liberica*; the leaves are a lighter green, thinner, and larger in size.

C. robusta bears more berries in a cluster than *C. liberica*, often over sixty; they are much smaller, but the beans are almost as large, as the skin is thinner. On an average, 10 piculs (133⅓ lb.) of Liberian berry give one picul of market coffee. On the other hand, only 4 piculs of the berry of *C. robusta* are required for a picul of market coffee. Though many more berries go to a picul than in the Liberian, the greater number in a bunch makes the picking, if anything, cheaper.

Plants about eight months old begin to show flower buds, but a number of these early flowers may not develop into berries, and no concern need be felt if they do not, as, unlike those of Liberian, all later flowers set.

The plant blossoms the whole year through, and no loss will occur from 'windfall' if berries are collected once a month. About ten months are required for the berries to come to maturity; when most of them in a cluster are straw-coloured they may be picked—as a rule the whole cluster may be gathered.

In Java it was at first urged against *C. robusta* that its fecundity would not continue, but it is now seen that nine-year-old plants are as vigorous and yielding as much as, or more than, they did when they were four years old.

The root development of *C. robusta* is comparatively rapid and intense. If a young plant is pulled up it will be found to have a mat of fine rootlets—considerably more than a Liberian plant of the same size would show. It is easily understood, then, that it thrives best in a loose clay soil, somewhat sandy for preference. Practically all our inland estates have soils which are admirably adapted to it.

In peaty land, experience here has already shown that it does not thrive, at least where the peat is deep and badly drained. It behaves just as rubber and other plants do when they suffer from acidity in the soil, except that *C. robusta* is more sensitive than the Para tree. The acidity of such soils must be removed by good drainage and a liberal application of lime. The quantity of lime required will vary with the acidity, which must be tested from time to time. It is now proved that by such treatment, Para rubber can be made to thrive, and no doubt *C. robusta* would too. *Coffea canephora*, which is equally prolific, would probably do better in such land.

THE SOURCES OF THE WORLD'S RUBBER SUPPLY.

Rubber reaches the home market in almost every possible shape and colour. In most cases the queer names which one reads in the market reports are fairly descriptive. Thin pale crêpe, for instance, arrives in long strips, generally about 4 feet long and 8 inches to 12 inches broad. It varies in thickness from $\frac{1}{16}$- to $\frac{1}{8}$-inch, and has a roughish surface, from which the name 'crêpe' is derived. This rubber is pale-yellow in colour, and when held up to the light it is quite transparent, which proves its purity, and accounts for the very high price obtainable for this grade, viz., at present about 10*s.* 3*d.* per lb.

The so-called 'sheet' rubber is similar to crêpe, but slightly thicker, and not so transparent. It is prepared in a different manner, and, unlike crêpe, must be put through the washing mills by the manufacturer before it can be used.

The world's present sources of supply for crude rubber are approximately as follows:—

	Tons.
The river Amazon with its tributaries	39,000
Other districts of Brazil	2,800
The Federated Malay States—Ceylon, Sumatra, etc., (plantation rubber)	4,600
The Congo Free State and the French Congo	5,600
Portuguese West Africa	2,900
The West Coast of Africa, excluding the Congo and Portuguese West Africa	9,500
Rangoon, Penang, Borneo, etc., (wild rubber)	1,200
East Coast Africa, Mozambique, Madagascar, etc.	800
Mexico, the East Indies, and Central America	1,500
	67,900

The figures given above are necessarily for the most part estimated, as with the exception of the exports from the Amazon, no exact records are obtainable of the production of the various districts, nor is it possible to obtain a complete record at the different ports of arrival, as statistics of some of the ports can only be obtained in an unclassified form, and from other ports no accurate statistics at all are obtainable. (The *Times Weekly Edition*, March 18, 1910.)

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 11, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, a good business has been done in West Indian Sea Island cotton, and the sales amount to probably about 600 bags, including Montserrat and Nevis 18*d.* to 21*d.*, St. Kitts 19*d.* to 21½*d.*, Anguilla 20*d.* to 21*d.*, Barbuda 20*d.*, St. Lucia 20½ to 21½*d.*, St. Croix 20*d.* to 21*d.*, Barbados 21*d.* to 22*d.*, St. Vincent 22*d.* to 24*d.*, with a few odd superior bags at 25*d.* to 27*d.*, and Stains of various qualities 11*d.* to 17*d.* The high relative price obtained for Stains is entirely owing to the advance in Egyptian.

Egyptian cotton is so dear that the demand for the lower grades of Sea Island remains brisk, whereas the finer qualities, which are only used for special trades, are heavy of sale this season. We expect that the West Indian crop will be readily absorbed this season, as fast as it arrives.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 2, is as follows:—

There has been a limited demand this week, resulting in sale of 94 bales, consisting of a crop lot, classing Extra Fine, and such odd bags as remained in stock, classing Fine to Extra Fine, the buying being for export.

The unsold stock is now reduced to about 250 bales, consisting very largely of Planters' Crop lots, held at 40c., 50c. and 60c.

There is also left on plantation, not yet ginned, about 100 bales, classing Fully Fine.

COTTON IN THE BRITISH WEST INDIES.

In the *Journal d' Agriculture Tropicale*, No. 104 (February 1910), an article appears by M. O. Labroy, entitled La Culture du Coton aux Antilles Britanniques. This contains a good summary of the present state of the cotton industry in the West Indies, and parts of it have been extracted, as follows :—

In the light of the fact that the Sea Island cotton, such as is produced in James and Edisto Islands (South Carolina) is generally considered to be the outcome of rigorous selection, conducted among surroundings eminently favourable to its cultivation, it is evident that it cannot be exploited in any other region, unless there are indications that the climate and soil are suitable to a reasonable degree, and unless it is the object of thorough selection which will render it most fitted to exist in its new environment, and will maintain the length of the fibre, its uniformity, strength and fineness, as well as the length of life and the resistance of the plant to parasites and storms.

The introduction of new types of cotton, against which Dr. Francis Watts has signified his opinion, has been equally criticised in other cotton-growing countries. M. Gammie (*Agricultural Journal of India*, April 1908) has finally shown that the attempts made for eighty years in British India to grow American, Egyptian and Bourbon cotton have failed, as regards the greater number of varieties. Examples equally convincing may be easily found in tropical Africa, and other regions, and it is well known that the attempts to grow Egyptian cotton in Arizona have been far from meeting with success. The question arises as to whether it would be advisable to conduct experiments with these same cottons in Jamaica, in accordance with proposals that have been made already. (*West India Committee Circular*, May 11, 1909.)

If it is decided, nevertheless, to effect the introduction of some variety showing great merit, it is necessary to give it attention, and to practise selection in relation to it, for three or four years before even its approximate value in the place of its adoption can be decided. The crossing of cottons, which might lead advantageously to the production of new types, has not yet been the subject of precise observation in the West Indies; experiments have been made, however, in the crossing of Sea Island with the native cotton. The greatest caution is required in the matter of the hybridization of cottons of different species. O. F. Cook has shown (Bulletin 147, United States Department of Agriculture, entitled *Suppressed and Intensified Characters of Cotton Hybrids*) that the interest of such hybrids remains especially limited to the first generation.

It is, above all, as a secondary crop, especially to succeed sugar-cane where fungus diseases have seriously damaged it, that cotton appears to us to have a certain future in the West Indies.

DISTANCE FOR PLANTING COTTON.

The following conclusions have been reached, as the result of experiments that have been carried out at the Surat (India) Agricultural Station with a view to determining the best distance at which to plant cotton, in the rows :—

(1) The spacing of 18 inches between cotton plants is not sufficient, for the yields of all the plots so spaced have fallen considerably below those obtained from the plots spaced at 24 inches, 30 inches and 32 inches apart, and there is very little to choose between these last three spacings, all giving about the same results in the present season.

(2) The best results in the case of thinning have been obtained with a 24-inch interval between consecutive plants. The plots thinned to this distance have yielded at a rate of nearly 40 lb. of seed-cotton per acre more than those thinned at 6 inches, 12 inches and 18 inches. This result was obtained

on land rather below than above 'good condition', having yielded a crop of Guinea corn in 1907-8, at the rate of 1,050 lb. per acre, while the cotton crop in the present season ran from 300 to 350 lb. of seed-cotton. No manure has been applied to this land, which came into the possession of the farm only two years ago. It will be interesting to see if future years' figures confirm these results.

(3) Generally, there seems to be reason for concluding that any arrangement of spacing and thinning which admits of more than 11,000 or 12,000 plants per acre has a prejudicial effect on the yield.

In this connexion, it is interesting to note that the distance of 2 feet apart in the rows has been found to be best in similar experiments conducted in St. Kitts. An account of these will be found in the *Report on the Botanic Station, Economic Experiments and Agricultural Education, St. Kitts-Nevis*, 1908-9.

THE USE OF THE PLOUGH.

There is nothing which adds so much to draught as the weight which the holder puts on to the handles. A man may hold a plough firmly, and yet add but little to the draught, and a well-set plough requires this rather than pressure. A plough that a skilled ploughman cannot set to run easily on fair land should be broken up, as it is a very expensive implement to keep. But if one looks over a plough that is difficult to hold, it is likely that there is one or other of the nuts that regulates some adjustment that has never been moved since it came from the works

Where the wheels are depended upon to regulate the depth of the ploughing, it is very important that they, and the standards and axle supporting them, are kept plumb true. If any part is bent it should be put right by the blacksmith, and any temporary derangement be set right by packing with a wedge to correct it. To set off, the coulter also should be arranged to assist the running. Where there is a tendency for the plough to run away from its work, it should be set a trifle wide to pull it back: but if it runs in, then it should be set narrower. The coulter can greatly aid when the plough runs away from its work through the land side of the point becoming rounded, and having a tendency to follow the inclination of the curve so formed. The coulter is ordinarily best set fairly well forward, but on stony grounds it is desirable to set it so that a stone does not pitch between it and the share. By setting a coulter point fairly forward, through its inclination it runs freely into the softer ground below, so that the cut is made up the edge, and the hard surface yields more easily in this way than when it is attacked more vertically. Sharp knives make easy work, blunt knives hard work: therefore the coulter, which is a knife blade, should be kept sharp. Sometimes one sees them little more than a round bar, with 3 or 4 inches flattened and thick to do the cutting—which is not economical. The nice adjustment of the coulter is very essential to the easy running of the plough.

The nicer setting of the plough is effected from the head or forepart of the beam, where there are two moveable parts —one with a vertical movement, and the other with a lateral. That with the lateral is known as the head, or T-head, and that with the vertical as the hake, or sliding head. In the steering of the plough, it has to be remembered that it is mainly done by balancing, using the bottom of the body as a pivot. If one wants to make it run more shallow, one weighs on the handles, and up comes the head. If one wants it to run to the right, one pushes the handles to the left, and it pivots round, and so on. The sliding head is made with a series of notches, which allow the draught chain to be adjusted as desired. When the ground is hard there is a tendency for the share to run upwards, and though the holder can resist to some extent by pressing the head down and holding against the tendency, he can be greatly relieved by allowing the horses to help him. This he does by altering the height of the draught point. Remembering that there is a pivot on which the plough balances, it is obvious that the higher the point of attachment, the more will the fore end of the plough be dipped, while the lower, the more will it be lifted out. The sliding head, therefore, affords easy correction to other faults which tend against a furrow of even depth. The draught chain, however, can be made to assist, for if short, the horses will lift the head, but if long, they will pull it down. Ordinarily, a short chain suffices, but on hard ground, a longer chain gives great relief to the holder, and the plough runs steadier.

The T-head is a continuation of the beam, and is quadrant-shaped, with pinholes at near intervals: it is used to assist in controlling lateral swerving of the plough. The pivot action has again to be regarded, and when it is desired to pull the big wheel away from the unploughed ground, the sliding head is pushed to the left, and if it is required to bite the unploughed land, it is pushed to the right, being held in place by means of a pin thrust through holes corresponding in the T-head and the sliding head. The alteration of the position of the sliding head to the rigid beam is necessary also, because the line of draught is widely different when horses draw in single line, when two are abreast, or when three are abreast, as each one necessitates the draught being more or less on one side or the other of the line of the beam: accordingly as the centre of the main whipple-tree is to the line of the beam so must the sliding head be fixed, and remembering the plough pivots, it has to be set wider, in opposition to the way it is desired to turn the head of the plough.

The setting of the breast or mould-board also influences the run of the plough, as the wider it is opened—that is, pushed out by the breast stay—the more will it turn the share point on to the work. With all these means of adjusting, it looks as though the setting of a plough ought to be a very simple matter, but the struggling efforts of many ploughmen give contradiction to this. In fact, to get all these points in harmony takes a considerable period to learn; moreover, they are subject to alteration every time different work is done, and beyond all this is the knowledge which directs the best type of work to be done for the purpose ahead.

When the plough is properly set, and, of course, still more so, when ill-set, there is much to do to make it run so as to give less strain to the horse and man. A furrow set deeper on the wing side of the share is always heavier in draught than one set with a level sole or slightly deeper on the little wheel, because the share cuts clean across when it is flat; but when the wing is lower than the preceding furrow, the new furrow has to be torn out. On heavy land, especially, the line of fracture may continue downwards for a considerable distance, and instead of a 9-inch furrow, it may break out 13 or 14 inches, bringing up very objectionable subsoil. This constitutes coarse ploughing. Coarse ploughing is not dependent upon the depth and width of the furrow, but on this breaking out of the subsoil.

When one says the plough is balanced with the centre as a pivot, this must not be taken to mean that there is merely one spot which acts as a pivot; it is spread over quite a large portion of the body and breast, as occasion demands, and experience alone teaches where to apply the adjustments in connexion with it from time to time. (The *Tropical Agriculturist*, February 1910.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of this issue presents the former of two articles on the functions of agricultural experiment stations.

An account of progress that has been made in the matter of the utilization of seedling sugar-canes in Louisiana is given on page 131.

The geographical distribution of the cocoa-nut palm is dealt with on page 132.

The sources from which the rubber supply of the world is derived are given on page 133. This is a matter of special interest, in view of the attention that is being paid to this product at the present time.

An article on page 135 gives useful information on the use of the plough.

The control of insect pests by means of their natural parasites is a subject that is gaining a constantly increasing interest, especially as it is now well demonstrated that this forms a practical means of reducing the numbers of such pests, in several instances. Work that has been done in Hawaii, in this connexion, in relation to sugar-cane is reviewed on page 138.

The Fifth Part of the series of articles that are being given under the head of Fungus Notes, entitled The Chief Groups of Fungi, appears on page 142. The figures are reproduced after Tulasne.

Index and Title Page.

The index and title page of Vol. VIII of the *Agricultural News* are published as a supplement to the present issue. This will give the opportunity for the numbers of that volume to be bound together.

Rainfall in St. Lucia.

The rainfall returns of St. Lucia, for 1909, show that there were four stations which received a precipitation of more than 100 inches. These were: Uplyme 124·14; Border 108·12; Soucis, 100·55; and Park, 100·01 inches. The stations at which a rainfall of near, or less than, 70 inches was obtained were Rivière Dorée (59·13), Black Bay (61·79), Retraite (70·57), and Invergoil (70·85): in the case of the last station, however, returns were only made for ten months and nine days, that is from February 20. The maximum rainfall in one day was registered at Soucis, namely 4·32 inches on October 18: it was here, also, that the number of days on which rain fell was largest, namely 323. The smallest number of days on which rain was received, namely 118, was at Black Bay. The average annual rainfall at Castries for twenty years is 91·09 inches.

A Simple Method of Electroplating.

An account of a method of elecroplating which seems worthy of notice by reason of its simplicity is given in a paper by the inventor of the process, published in the *Journal of the Royal Society of Arts*, for February 4, 1910. The efforts that resulted in the making of the invention arose from a desire to devise a process by which any person of ordinary intelligence could, without any technical training, produce an electrolytic deposit. The chief difficulties in the way of attaining this object were that it was absolutely necessary that no heating or baths, or any poisonous ingredients, such as cyanide of potassium or mercury should be employed, and that there should not be a multiplicity of powders or liquids used. The method consists in the utilization of a mixture of powdered substances, to which its inventor has given the trade name of 'Galvanit', by the aid of which a given metal is deposited by applying the powder by means of a rag or brush, and rubbing the object to be coated, in the presence of moisture. No preliminary treatment of the surface on which the deposit is placed is required, other than making it reasonably clean and bright; the rubbing with a rag or brush cleanses and polishes the newly deposited surface, while the deposition of the metal is taking place. In the case of a particular metal, the corresponding powder has to be used; the process is not confined to simple metals, but many alloys, such as brass and gun metal, can be used for coating suitable surfaces, by its aid. In addition, the powders can be used for depositing metals on aluminium—an important matter when the difficulty of plating aluminium in the ordinary way is considered.

The Galvanit tin powder is stated to be of special use for renewing the tinned surface of cooking utensils; any domestic servant is capable of accomplishing this

without any greater expenditure of energy than that required to scour the vessel that is being treated.

The process permits of the deposition of several metals one on the top of the other, as for example, tin on nickel, copper on tin, and so on, without removing the metal deposited previously. The powders are being produced on a commercial scale by the Galvanit Manufacturing Company.

The Preservation of Timber.

Particulars of a process for preserving timber have been given recently in the *Agricultural News* (Vol. VIII, pp. 249, 408). An account of another means for the same purpose is contained in the *Monthly Magazine of the Incorporated Chamber of Commerce* of Liverpool, for March 1910. This originated in the discovery that carbolic acid, dissolved in alcohol or oil, possesses only slight antiseptic properties, while its great preservative qualities appear when it has been mixed with water. Another fact that has been demonstrated is that creosote which has been freed from tar acids has antiseptic properties equal to those of the original oil, containing about 10 per cent. of it. These considerations have given a clue as to the correct treatment of the creosote oil obtained from coal tar. They indicate that the aim of the manufacturer should be to extract all the tar acids from the creosote, in order that the oil and the tar acids should be available separately for the purpose of preservation.

The main point in the new process is that the tar acids are combined with lime into a salt which is soluble in water, so that their efficacy is maintained, while they are obtained in such a condition that the impregnation of timber by them can be easily effected. The liquid that is obtained by the process has been given the name of Cresol-Calcium, on account of the fact that cresol is the chief ingredient among the tar acids.

It is claimed for the new preservative, that: (1) it is, at least, as efficacious as any other preservative, and in several instances considerably more so; (2) the cost of treating timber is much smaller than in any other known method, being about 15·5 per cent. of that of the old way; (3) it can be easily distributed in the timber in large or small quantities; (4) the preservation of timber with cresol-calcium can be carried out in accordance with all known impregnating methods; (5) all plants already in existence for impregnating timber can be employed; (6) wood treated by this method is less inflammable than that impregnated with creosote, and the timber is very much cleaner to handle; (7) cresol-calcium can be prepared from tar acids produced either from kiln-burnt tar or tar oils.

Trials of the method are to be made by the Swedish State Railway, the Swedish Impregnating Co., the Forest Service of the United States Department of Agriculture, several railway companies in England and France, and in several British Colonies. Further particulars of the process may be obtained from Messrs. Blagden, Waugh & Co., 50 & 51, Lime Street, London, E.C.

Scheme for the Improvement of Pastures.

A scheme for the improvement of pastures in Antigua has been originated by Colonel the Hon. R. Stapleton Cotton, which consists, broadly speaking, in the awarding of prizes for the best kept pastures in the island. It has met with the approval of the Antigua Agricultural and Commercial Society, and arrangements have been made by which it will be carried into effect by the Department of Agriculture, acting in co-operation with that society.

Three prizes are offered for competition: the first, of the value of £21, by Colonel the Hon. R. Stapleton Cotton; the second, worth £10, by Messrs. Henckell, du Buisson & Co.; while the value of the third has not yet been decided. The chief conditions in the competition are: (1) competing pastures must have been properly entered for it: (2) they must not be less than 20 acres in area; (3) they must be free from all 'bush'; (4) one suitable shade plant, preferably the Saman tree (*Pithecolobium Saman*), at least, must be planted per acre, and this must be properly fenced and growing at the time of judging: (5) pastures must have been used regularly as such up to that time; (6) in the event of no pasture of sufficient merit being entered for competition, the prizes will not be awarded: (7) the appointment of judges for the competition shall rest with the Department of Agriculture, acting with the Agricultural Society, and the final decision, in any matter of dispute, shall rest with the Imperial Commissioner of Agriculture.

Use of Charcoal in Fattening Ducks.

The *Journal of the Board of Agriculture* for last month gives an account of some experiments that were carried out in England for the purpose of deciding the value possessed by charcoal as a means of keeping ducks in good health that are being fattened in close confinement. In the experiment, food was employed which had been shown to be profitable and economical, namely boiled potatos, barley meal, ground oats, skim milk and tallow greaves. Plenty of grit and drinking water were supplied. The food was the same for all the different lots of ducklings under experiment, except that in one case an unlimited amount of rough charcoal was given, while in another powdered charcoal was mixed with the food, before it was moistened, at the rate of one-fifth of charcoal to four-fifths of the other ingredients.

It was shown by the trials that some form of charcoal is essential in the process of fattening ducks. The ducklings were apparently kept healthy by it, and fattening could be continued with profit for a much longer period than when the food did not include charcoal.

As far as the increase in the weight of the ducks is concerned, the best method of giving the charcoal appears to be to mix it with the food, but the slight increase in weight hardly pays for the extra cost entailed in grinding it and incorporating it with the food.

The charcoal employed in the experiments was obtained by 'burning' wood.

INSECT NOTES.

NATURAL ENEMIES OF SUGAR-CANE PESTS.

The control of insect pests by means of their natural enemies is being attempted on a large scale in many parts of the world. The largest of these trials is perhaps being made in connexion with the gypsy moth in massachusetts, while the results that have been obtained in the control of citrus pests in California, and of sugar-cane pests in Hawaii, are sufficiently striking to attract attention. Mention has also been made in a recent number of the *Agricultural News* of the results obtained in Florida by means of the fungoid parasites of certain scale insects.

Mr. F. Muir, an entomologist on the staff of the Hawaiian Sugar Planters' Experiment Station, has recently visited islands in the Malay Archipelago in search of parasites of the sugar-cane borer (*Sphenophorus obscurus*) for introduction into Hawaii. An interesting account of the entire trip has appeared in the *Hawaiian Sugar Planters' Monthly*, in the numbers for September and November, 1909. The first of these was reviewed in the *Agricultural News* (see Vol. VIII, p. 393), where it was mentioned that three parasites had been found. One of these is a Tachinid fly, one a Histerid beetle, and one a beetle of the family Elateridae.

The Tachinidae are a family of the order Diptera, well known for their parasitic habits. The Histeridae are beetles of diverse habits, a few being predaceous, but the greater number are feeders on decaying and fermenting matter of all kinds.

The Elateridae are the click-beetles or skip-jacks, whose larvae, known as wire-worms, for the most part feed on the roots of plants, and many species are injurious to cultivated crops. The large fire-flies (*Pyrophorus noctiluca*), common in many of the West Indian Islands, also belong to this family. It is of interest that members of these two families of beetles should be discovered to be parasitic in habit.

The second part of Mr. Muir's report gives an account of his visit to New Guinea (Papua). Here he found the *Sphenophorus* borer holding a secondary position as an enemy of sugar-cane; a very large proportion of the borers collected were parasitized. The most prominent insect pest of sugar-cane was a moth borer related to *Diatraea* which was not held in check to anything like the same extent as the *Sphenophorus*, by its insect parasites.

It should be mentioned that, in the localities where the parasitized borers were found, sugar-cane is not grown for the purpose of sugar-making, but rather for eating. Each native grows a few stools of sugar-cane in his garden, where it produces seed freely, from which young plants readily spring. It would thus appear that the sugar-cane plant grows under the most natural conditions in New Guinea, and that where these prevail, the plant, the pests, and the enemies of the pests should all occur under those circumstances which establish a balance of nature.

Mr. Muir was taken ill in Brisbane and was unable to accompany his cages containing parasitized borers on the long journey from Australia to Honolulu, and the parasites received no attention. As a consequence, none of them were alive on arrival at Honolulu. Mr. Muir believes that with the experience he has gained, he will be able on his next visit to Papua to keep the parasites alive until they arrive safely in Hawaii.

In addition to the efforts that have been made in Hawaii to introduce the natural enemies of the pests which occur in those islands, very stringent laws have been passed with the object of preventing the importation of additional pests.

With regard to the danger of importing these into Hawaii, Mr. Muir writes in his report: 'When I consider the numerous species of insects that I have found living on sugar-cane in the various places I have visited during the past three years, some belonging to groups of which we are quite free at present, any one of which might prove as destructive as the leaf hopper or beetle borer, I then fully recognize the necessity of keeping the strictest supervision over all imported plants and fruits.'

The investigations in connexion with the sugar-cane borer in Hawaii should be of interest to sugar planters in the West Indies, on account of its similarity to the weevil borer in this part of the world.

In the Hawaiian Islands the sugar-cane borer has been known as a pest of canes since 1865, and in 1904 the damage caused by this was estimated at $500,000. The larva is known as a borer in bananas, the royal palm (palmiste) and the toddy palm (*Oreodoxia regia* and *Caryota urens*) and the papaw (*Carica Papaya*). In the West Indies the weevil borer (*Sphenophorus sericeus*) is known to attack sugar-cane only, while a related species (*S. sordidus*) attacks bananas in certain islands. The attacks of the weevil borer in the West Indies were much more severe a few years ago than they are reported to be at present. It is a question as to whether this has come about as the result of the more universal cultivation of newer varieties, or from the practice of burning rotten canes, which is more general now than formerly, or as the improvement due to the control exercised on the borer by natural enemies.

Mr. Muir writes that the reintroduction of soft canes into Fiji from Queensland has been accompanied by an increase in the severity of the borer attacks. By 'soft cane' is probably meant a cane having a soft rind, and the difference between hard and soft cane may be illustrated by some of the seedling canes and by the Bourbon.

FOREST ENTOMOLOGY IN THE UNITED STATES.

The *Report of the Entomologist*, United States Department of Agriculture, for 1909, gives information that the last piece of work of the Bureau during the year was connected with plans for co-operating with a State entomologist in making a survey to determine the principal insect enemies of forest trees, as well as the damage done by them, an assistant being provided by the State, who will work under the immediate instructions of the Bureau, subject to the approval of the State entomologist. By this means, a field of survey and practical control work will be opened up, so that any state, by the expenditure of a comparatively small sum of money may obtain authoritative advice, based on wide investigation. At the same time, the Bureau will be in the possession of a valuable means of obtaining information for subsequent dissemination and of making practical demonstrations of methods of insect control. Such work will lead to a more general recognition of the importance of the subject, and of the measures by which the damage to forests by insects may be minimized.

OUR BOOK SHELF. NOTES and REVIEWS.

THE RAT PROBLEM. By W. R. Boelter. *John Bale, Sons and Danielson, Limited, London.*

The object of this book is sufficiently stated in the introduction: it is to present the case against the rat so completely as to ensure the passing of a bill through Parliament, on the lines of the Danish Rat Law, which shall ensure co-operative effort toward the destruction of this pest. After this, the objections to the rat are presented in the first three chapters, which deal respectively with the history of the rat, the economic losses caused by it, and the part played by it in the dissemination of disease. Chapter IV deals with the means for the extermination of rats, and a useful summary of the conclusions reached is given in Chapter V. Finally, Chapters VI and VII present an account of various rat laws, together with a draft of the one proposed for adoption in England, and a bibliography of the subject.

Employing the subject-matter of the book, it appears that the position in England, as regards the brown rat, may be summed up in the following way. This animal seems to have reached that country from India, in the year 1732, since when it has exterminated the black rat and become a national pest. Five factors seem to have contributed to the latter result: its physical and mental faculties; its great fecundity; the provision of more food and shelter through the increase of the human population; the killing of its natural enemies; and the lack of co-operation for the purpose of destroying it. The increase in numbers has become a serious matter, on account of the damage that is constantly effected by it, and because of its acting as a carrier of diseases such as trichinosis and bubonic plague, and the problem of its destruction has become of national importance. As there is no ideal means of effecting this destruction, any method for killing rats is worthy of adoption as long as there is general co-operation in the matter, and the State should arrange for this co-operation by the passing of suitable laws and the provision of funds. In the meantime, something may be effected by public support of rat-killing clubs organized by the Incorporated Society for the Destruction of Vermin.

Interesting information is given as to the efficacy of such of the bacteriological preparations, for the destruction of rats by injecting them with disease, as have been found worthy of investigation. Of these, that known as Issatschenko's bacillus has been shown to be fairly effective for a few generations. The virulence of the disease produced by the Danysz virus is obtained artificially, and is said to be unstable; rats become immune to the disease, which has a further objection in that it is not contagious among them. These facts make it of little practical value, and this characteristic is stated to be shared by the cultures of the *Bacillus Danyszi* known as the Pasteur virus, the Liverpool virus and the Laroche virus. Ratin, which consists of cultures of Neumann's bacillus, is stated to have been very successful, except in certain isolated areas. Success is also claimed for the preparation called Raticide, which produces a disease that is transmitted in a more virulent form to those rats which have attacked and eaten the ones that were first to suffer from its effects. There are, however, no official feeding tests which show that this culture is harmless to other animals.

To return to the book itself, it is evident that it has been written with a view to gaining the attention of the ordinary reader, and it is to be feared that too great an effort has been made to this end, with the result that it is loaded with a deal of matter that is of very little use in connexion with the subject. This has caused the inclusion of much, both as regards text and illustrations, that may have been omitted with advantage. To this are added the drawbacks that the figures are not numbered and that there is no index. Nevertheless, as is shown above, it contains much that should be of use to all who are interested in the problem with which it deals.

INCUBATORS AND THEIR MANAGEMENT, by J. H. Sutcliffe. *FRUIT CULTURE FOR AMATEURS*, by S. T. Wright. *L. Upcott Gill, London.*

These form two of the volumes of a number of practical hand-books that are being brought out by this firm of publishers: they may be obtained at the price of one shilling. The first-mentioned is of the greater interest to those living in the West Indies, as the second is devoted to the consideration of hardy fruits alone; they will therefore be considered in the order given above.

Incubators and Their Management was written with the idea of presenting the information that the author was desirous of possessing when he first became interested in the subject of incubation, and it fulfils this purpose successfully. The first four chapters are devoted to subjects connected with natural incubation and the development of the chicken in the egg. Chapters V to X treat very thoroughly of incubators, and in reading them, there is evidence of a desire to deal fairly with the different types of apparatus; special attention might be drawn to the account of a home-made incubator which is described in Chapter X. The two last chapters deal with the artificial rearing of chickens, and egg testers and egg boxes. The style in which the book is written is simple, and it is completed by a useful index.

The fact that *Fruit Culture for Amateurs* is written by the Superintendent of the Royal Horticultural Gardens, Wisley, gives an indication of its value, and a perusal of the work will show that it fulfils the promise of its authorship. The greater part of it can only be of very general interest, however, to those in the West Indies; matters which more closely concern such readers will be found near the end, where grafting, budding, manuring, storing and preserving fruit, and its packing and marketing are dealt with. The book is written in a pleasant style and, like the one just reviewed, contains a good index.

THE WEEKLY TELEGRAPH GARDENING BOOK. Published by the Proprietors of the Weekly Telegraph, London.

Like the two books just reviewed, this is issued at the price of one shilling. It contains a large amount of information, is profusely illustrated, and is well worth the price asked for it. Although most of the gardening instructions are naturally of small application in the tropics, the work is of value to those interested in gardening in the West Indies, on account of the adequate descriptions of plants, and the information as to the conditions under which they grow best, which it gives. Such persons will find it worth obtaining, if only for the aid to the selection of plants for different purposes, on pages 191 to 194, and for its useful illustrations.

GLEANINGS.

No. 70 of *Colonial Reports and Papers—Miscellaneous* has been issued recently. It presents a list of colonial laws dealing with patents, designs, trade marks, and the marking of merchandize, and regulations issued thereunder.

Pamphlet No. 96 of the Wellcome Chemical Research Laboratories has been issued as a reprint of part of the issue of the *Pharmaceutical Journal*, dated November 13, 1909. It deals with the tests for purity of quinine salts.

The *Report of the Division of Biology and Horticulture*, 1909, of the New Zealand Department of Agriculture, states that the bee industry in New Zealand is rapidly expanding, and that it was confidently estimated that the output of honey and wax during 1909 would be worth at least £45,000.

The Comptroller-General of Trade and Customs at Melbourne reports that, during the half-year ended December 1909, 70,795 lb. of cotton was gathered in Australia, all being produced in Queensland. The total production for the year amounted to 173,470 lb. (The *Board of Trade Journal*, March 24, 1910.)

According to the *Report on the Progress of Agriculture in India* for 1907-9, experiments with calcium nitrate and calcium cyanamide, as manures for wheat and linseed, did not give very encouraging results. There was a small increase in yield due to the application of calcium nitrate, but this was not sufficient in any case to constitute a profitable return.

The Union Coloniale Française, which began its colonial congresses by that in North Africa in 1908, and by that of the older French colonies in 1909, is continuing its work, and it has been decided that the congress which will take place at Paris on October 10 to 15, 1910, will have for its subject the questions which are of interest with respect to East Africa; that is to say, on one hand Madagascar and its dependencies, and on the other hand the Somali Coast (Djiboutil).

It is stated by Mr. Joseph Jones, Curator of the Botanic Gardens and Experiment Station, Dominica, that the weather in that island during the three weeks ending March 1, 1910, was very abnormal for the time of the year. In common with the rest of the West Indies, very high winds were experienced, accompanied by heavy rains. The unusual nature of the rainfall at the Botanic Gardens during February 1910, is shown by the fact that it amounted to 11·42 inches for that month, whereas the mean rainfall for the same period, during sixteen years, is 2·87 inches. In relation to this matter, it may be mentioned that a note on the rainfall of Dominica for 1909 appeared in the last issue of the *Agricultural News*.

The area under sugar-cane in Eastern Bengal and Assam in 1909 is estimated to have been 170,800 acres, as compared with 177,800 in 1908. The final forecast of the crop, issued by the Department of Agriculture, gives this as 97 per cent. of the normal outturn per acre. Taking the latter at 1·2 tons, this gives a total yield of 198,810 tons, or 14 per cent. more than that of last year. During the year under report, the quantity of raw sugar produced from date palms is estimated to have been 53,950 tons.

It is not considered good policy in Mexico to plant rubber alone. On account of the climatic conditions of the country, there is a season when the rubber does not provide labour for all the hands, and for this reason it is advantageous to have other crops on the estate. It is, besides, a matter of wisdom and foresight not to stake everything on one crop, however good it may be. Most Mexican rubber plantations, therefore, have a diversity of crops, such as coffee, cacao, sugar, fibres and others. (Dr. Pehr Olsson-Seffer in *Tropical Life*, March 1910.)

The *Annual Report on the Experimental Work of the Dharwar* [India] *Agricultural Station*, for 1908-9, states that the expensive cultivation of potatos in the wet season in black soil, and the primitive way of making furrows for planting the potatos by the native method, caused the Department to introduce a new improved English double mould-board plough for such work. On the Experiment Farm this had been done hitherto by means of a Planet Junior hoe, but it was found that the double mould-board plough was much superior to that implement for the purpose.

The results obtained in the science subjects taken by the candidates at the St. Kitts Grammar School in the Cambridge Local Examinations held in December last were as follows: Agricultural Science (Senior), 1 candidate: 'good'; Chemistry (Senior), 1 candidate: 'good'; Chemistry (Junior), 5 candidates four 'good', 1 'pass'; Chemistry (Preliminary), 3 candidates: 'good', 'moderately good', 'pass'; Botany (Junior), 3 candidates: 2 'moderately good', 1 'pass'. It is thus seen that there were no failures in any of the papers in Natural Science, and that of the thirteen papers taken, ten were marked 'good' or 'moderately good', and three satisfied the examiners. Four of the candidates were holders of agricultural scholarships.

With reference to the Second International Congress of Tropical Agriculture and Colonial Development to be held at Brussels on May 20 to 23, 1910, of which an announcement was made in the *Agricultural News*, Vol. IX, p. 12, the following information has been recently received. The subscription to the Congress for non-members of the International Association of Colonial Agriculture is fixed at 15 francs, for those who desire to receive copies of the Congress publications, and 10 francs for those who do not. The subscription for members of the International Association will be 10 francs, and this will entitle them to receive copies of all the Congress publications. Subscriptions for the Congress should be sent to M. Vandervaeren, Ministry of the Interior and of Agriculture, Brussels, Belgium. It may be stated that associate membership of the International Association of Colonial Agriculture may be obtained by payment of an annual subscription of 15 francs.

STUDENTS' CORNER.

MAY.

First Period.

Seasonal Notes.

Lime plots that are in full growth should be well manured with pen manure. This should be spread evenly on the soil, after the weeding is completed: it must not be heaped at the base of the trees. What is the reason of this in relation to (1) the way in which the roots grow, (2) the changes that take place in the manure, (3) the effect on the soil? All dead branches should be removed from the trees, placed in heaps, and burnt in an open space. What causes are there for burning such material? The ash that is left may, with advantage, be scattered over the soil in which the plants are growing. To what does this ash chiefly owe its value as a manure?

A careful examination of lime trees for epiphytes and parasitic plants should be made, and these should be removed. What is the chief difference between an epiphyte and a parasite, and how may plants of the former kind do damage to the trees on which they are growing?

It is important that a careful look out for scale insects on lime trees should be kept. Useful information will be obtained by making notes on the distribution and spread of these, attention being given at the same time to the weather conditions, especially in relation to rainfall and the force and direction of the wind. Opportunities will be available, where Bengal beans have been planted in lime cultivations, to observe the effect of these in keeping scale insects in check. Note that those scale insects that chiefly attack the stem, such as the purple scale and the snow scale, are rarely followed by black blight, but that those which are found mainly on the leaves are chiefly responsible for the encouragement of the growth of this fungus, examples being the common shield scale and the Lantana bug. Observations on scale insects should not be confined to those occurring on cultivated plants; the examination of wild plants will prove of great interest, especially as it may afford some clue as to a probable way in which the infection of the cultivated plants may take place. Look for examples of scale insects attacked by fungi (see *Agricultural News*, Vol. VIII, p. 299; Vol. IX, p. 30).

Provision for green dressing material may be made by sowing seeds of some suitable plant, such as the horse bean, when there is sufficient rain to ensure successful germination, and cutting the plants back to about 4 inches above the ground as soon as they commence to flower. A new growth will be speedily obtained, and the ground will be covered in a few weeks. If such a green dressing is grown in this way and buried in the soil beneath, what does it add to the soil? What effects have green dressings on: (1) the physical state of the soil, (2) the plant food already present in the soil at the time when they were applied? For what kinds of soil is care required in the matter of using green dressings, and what are the circumstances under which the application of these may result in actual harm? (See *Agricultural News*, Vol. VIII, pp. 225 and 241.)

Preparations should now be made for dealing with the June crop of limes. These will consist chiefly in the overhauling of the mill, tayches, packages, etc., so that everything may be in order for the concentration of the juice and its shipment, and the provision of a sufficient amount of fuel. Why is lime juice usually concentrated before being shipped? What other means of preparing the product for export is employed, and what are its advantages? (See *West Indian Bulletin*, Vol. VIII, p. 167; Vol. IX, p. 193; and Pamphlet No. 53, entitled *A B C of Lime Cultivation*.)

On cotton estates, where ginning is in progress, the opportunity should be taken to make observations on the working of the cotton gin, and to become familiar with the adjustments that are required by this machine, which, if it is to do its work properly, requires to be frequently overhauled. Information in connexion with cotton gins is given in Pamphlet No. 60 of the Department Series, entitled *Cotton Gins, How to Erect and Work Them*.

When the ginning of the present cotton crop has been completed, it should be possible to ascertain the yields that have been obtained from the different fields, and the notes that have been taken during the growing season will afford a means of gauging the effects of manurial treatment, and of insect and fungus pests on the produce of the plant. The information that will be obtained in this way will show the value of careful and continuous observation.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the chief causes of fertility in a soil?

(2) Give an account of the principal ways in which scale insects are distributed in nature.

(3) What are the chief differences between monocotyledons and dicotyledons, and how are some of these connected with the possibility of grafting, in relation to a given plant?

INTERMEDIATE QUESTIONS.

(1) What are the chief advantages to be obtained by the early planting of cotton?

(2) Under what conditions does the most successful fermentation of pen manure take place?

(3) Give an account of the trees that may be used for shading cacao, and indicate the special conditions under which the use of each of them is advisable.

CATCH CROPS FOR RUBBER IN MALAYA.

The *Quarter Century Number of the India Rubber Journal* contains an article on the catch crops that are employed in cultivations of Para rubber in Malaya. After explaining that many planters were at first discouraged in the matter of starting rubber plantations, on account of the fact that so long a time elapses before the plant becomes remunerative, it shows how some attempted to ameliorate this condition by the employment of catch crops.

One of the first of these to be used was coffee; in fact the pioneers of rubber-planting in Malaya were coffee planters whose rubber trees were, in many cases, grown among coffee plants. Cassava was shown by the Director of the Singapore Botanic Gardens to be a suitable crop for the purpose, chiefly on account of the additional tillage of the land that its cultivation induced. Sugar-cane has proved to be valuable in this connexion; an instance is given in the case, of an estate in Perak, where 2,000 acres of rubber has been cultivated among canes as a catch crop, partly during two, and partly during three, years, while the revenue from the sugar has more than covered the expenditure on the estate. Bananas have proved valuable, whether the fruit was exploited or not, for in the latter case, the cultivation is useful in keeping down weeds, and on light land, the texture of the soil was improved. Indigo has also been employed with success, as a catch crop.

It is stated that, in order that the full benefit may be derived from catch crops among rubber, the rows of trees should be about 30 feet apart, and that there should be a space of 3 feet on each side of the stems in the row, where nothing should be allowed to grow.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part V.

The Ascomycetes (continued). In the last number of the *Agricultural News* the characters of the chief subdivisions of this large group of fungi were considered, mainly from the point of view of the ascus fructifications. It now remains to make a few general remarks about the other spore forms belonging to the group. These are very numerous and varied, and can only be discussed very shortly here; a more elaborate account of them will be given when considering the Fungi Imperfecti, to which many of them were at one time thought to belong. The conidial spore forms may roughly be divided into three groups. Firstly, there are those in which the spores are borne freely exposed to the air, the conidiophores arising directly from the hyphae of the vegetative mycelium, as in the mildews and moulds. Secondly, forms in which the conidiophores arise as terminal or lateral branches of hyphae, woven together to form a more or less definite fructification, as, for example, the red heads of *Sphaerostilbe coccophila* on scale insects, and the *Fusarium* stage of the cacao canker fungi. Thirdly, forms in which the conidiophores and conidia are contained in closed fructifications, often opening by a pore, known as *pycnidia*, and closely resembling the perithecia of the Pyrenomycetes. The simplest form of conidiophore in the first group is a lateral or terminal hypha producing a single spore, which is abstricted and falls off, after which another is formed. In some cases, the spores may simply stick to the sides of the conidiophore, and then a head of spores, held together by mucilage, is formed. In other cases the conidia may be produced in chains, each conidium sticking to the one immediately behind it. The conidiophores may be branched, or given off in whorls, from three to six in each whorl, from a hypha whose tip is also a conidiophore. In other cases, the end of the hypha may be swollen and covered with small knobs, or *sterigmata*, from each of which one or a chain of spores is formed. Examples of these spore forms occur, as has been already stated, among the moulds, such as the common blue moulds, *Penicillium* spp. which grow on jam, bread, and other decaying substances. The mildews of grapes, cotton and roses are also conidial stages of ascomycetous fungi. Spores produced in this way are intended to increase the numbers of a species: while the ascospores which are usually produced as the food-supply becomes exhausted, are intended to carry on the species until favourable circumstances again arise, and consequently often will not germinate until they have passed through a resting period of some months. With regard to the other two forms of conidial fructification, nothing further need be said here. It only remains to be added, before concluding the description of the Ascomycetes, that some species in this group may have both the first form and one of the other two, in addition to the ascospore stage.

Fig. 23. Ustilago Maydis. Swellings on the Stem of Indian Corn.

Fig. 24. Germinating Spore.

The Basidiomycetes. This group of fungi may, for the purposes of this article, be divided up as follows:—

Ustilagineae.
Uredinales.
Hymenomycetes.
Gasteromycetes.

In the first two groups, the basidium is divided up into four cells by transverse septa. In the Ustilagineae, each cell of the basidium gives rise directly to numerous small sporidia. In the Uredinales, however, each cell of the basidium gives rise to a lateral sterigma, and each sterigma forms one sporidium terminally. In the other two groups, the basidium is unicellular and forms four terminal sterigmata, from each of which a sporidium arises. (See *Agricultural News*, Vol. IX, p. 94, Fig. 12.)

The ustilagineae. The members of this group are the well known 'smut' fungi of various crops belonging to the grass family. A full account of them was given in the *Agricultural News*, Vol. IX, p. 59, so that nothing further need be added here. In Fig. 23, a portion of the stem of Indian corn is represented, affected by the fungus *Ustilago Maydis*; it shows very clearly the characteristic swellings produced by the fungus. Fig. 24 shows a germinating spore of the same fungus. It has formed a septate basidium, from three cells of which sporidia have been produced.

The uredinales. This group of fungi is entirely parasitic in habit, and its numbers are often extremely specialized with regard to the host plants on which they can live. The whole group has been extensively investigated and is of great interest, as will, it is hoped, appear later. One stage of the life-history forms the 'rust' disease of the leaves of many different plants. The other gives rise to the 'cluster cups', also well-known signs of disease in many temperate countries. The actual damage done by different members of the group varies very largely. The forms best known in this part of the West Indies are: rust of cotton (*Uredo gossypii*, *Agricultural News*, Vols., IV, p. 246; V, p. 183; VI, pp. 135, 174) rust of ground nuts (*Uredo arachidis*; see *Agricultural News*, Vol. VIII, pp. 315 and 347), and rust of cannas (*Uredo cannae*). In this stage, the fungi form small light- or dark-brown areas under the epidermis of the leaves and green stems of the host plant. When the spores are ripe, the epidermis of the host is broken and the spores are freely exposed to the air. The 'cluster cup' stage is usually more circular, and often bounded by an irregular fringe of the whitish torn epidermis of the host plant. The

Fig. 25. Uredo linearis. (a) Three Uredospores. (b) Germinating Uredospores.

colour of the spores formed in the cup, and the consequent colour of the inside of the cup, is usually brown, or reddish-brown.

These fungi produce, in all, four different types of spore, though some species may show only two types, or even only one type. The description of these four types, together with the difference in the host plants on which they occur, and one or two similar points of interest will be described in the next number of the *Agricultural News.*

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of March :—

The general condition of the markets in drugs and spices during the month of March has been quite of a normal character, the only exceptions being in cocaine and rubber. The first article has been disposed of at considerably reduced rates, due, it is said, to two makers selling at undercutting prices, which has led to others falling into line—a result of the decreasing demand for this drug. Though India rubber is an article outside the scope of our review, we cannot refrain from mentioning it, occupying, as it does, an immense amount of attention, little, if anything, short of excitement; 11*s.* 5*d.* to 11*s.* 6½*d.* per ℔. being quoted for hard fine Para, at the time of writing.

GINGER.

The market in this article has been dull throughout the month, there being but very little demand. No offerings of Jamaica have been made, and for most other kinds the offerings have been bought in. At the first spice auction on March 2, 393 packages of Cochin and Calicut were brought forward, all of which were bought in at firm prices—unsorted Calicut at 62*s.*, rough brown Calicut at 52*s.*, and good bright washed Cochin at 52*s.* A week later the offerings amounted to 180 bags of bold, bright, washed Calicut, and 138 bags of good plump, washed Cochin. The prices at which they were bought in were 48*s.* and 50*s.*, respectively. Again on the 16th, a large quantity of Cochin and Calicut was offered, the principal portion of which was disposed of privately; good bright washed Cochin was bought in at 52*s.* 6*d.*

NUTMEGS, MACE AND PIMENTO.

At the spice auction on the 16th, West Indian nutmegs were steady, 148 packages were offered, and sold at slightly increased rates. At the same sale 32 packages of West Indian mace were disposed of at the following rates—fair pale 2*s.* 1*d.* to 2*s.* 2*d.* per ℔., palish 1*s.* 10*d.*, fair red 1*s.* 8*d.*, to 1*s.* 9*d.*, dark red 1*s.* 6*d.* to 1*s.* 7*d.*, and broken 1*s.* 5*d.* There was very little demand for Pimento during the month, a few bags only being sold at 2¼*d.* per ℔.

SARSAPARILLA.

The first sale of this drug took place on the 10th, when there were offered of Lima-Jamaica 25 bales, 6 of which were sold at 11*d.* to 1*s.* per ℔. for fair quality; of native Jamaica 56 bales were offered and 16 sold at prices of 10¼*d.* for fair red and 11*d.* and 9*d.* for other qualities. Of 32 bales of Guatemala character, none were sold, 9*d.* being the reserved price. Honduras was represented by 4 bales, all of which was bought in at 1*s.* 6*d.* per ℔, while 7 bales (all that were offered) of coarse Mexican realized from 4*d.* to 4½*d.* per ℔.

At the auction on the 23rd, the following offerings were made: Grey Jamaica 2 bales, both of which were disposed of at 1*s.* 3*d.* Of native Jamaica, 12 bales were offered and 4 sold, fair red and tawny fetching from 10*d.* to 11*d.*, and dull mixed and yellow 8½*d.*; 15 bales of Lima-Jamaica were offered and bought in, and of 10 bales of Mexican, 3 were sold at 4½*d.* per ℔.

OIL OF LIME, LIME JUICE, ARROWROOT, TAMARINDS, ETC.

West Indian distilled oil of lime, at the beginning of the month, realized 1*s.* 6*d.* per ℔. for good, and 5*s.* 9*d.* to 6*s.* for hand pressed, prices which ruled throughout the month. Of lime juice, concentrated West India fetched £18 5*s.* at the beginning of the month, but later advanced to £18 10*s.*, and at the close of the month to £18 15*s.*; 1*s.* per gallon was the quotation for good pale raw West Indian juice. Little or no interest has been shown in arrowroot. About the middle of the month some 50 barrels of manufacturing St. Vincent were offered and all bought in at 2*d.* per ℔. At the drug auction on the 10th, a single barrel of West Indian tamarinds sold at 5*s.* per cwt., duty paid. East Indian were offered at 11*s.* 9*d.* At the same sale, 14 baskets of good Java Cassia Fistula were offered and bought in at 20*s.* per cwt.

A MEANS FOR PREPARING PARA RUBBER.

The *Journal d'Agriculture Tropicale* contains, in a recent number, an account of a method known as the Purub process for coagulating the latex of *Hevea brasiliensis.* Purub is a contraction of the words 'pure rubber', and is an invention brought out by Dr. Sandmann.

The process consists in the addition of water to the fresh latex, to which, after a fine cloth has been passed through it, there is added a solution of Purub of 1 per cent. strength, the mixture being stirred. After this has been allowed to stand for several hours, the rubber, which has collected on the surface, is skimmed off, and as much of the water pressed out of it as possible. Prepared in this way, it is soon ready for dispatch from the estate.

The active agent in the coagulation is hydrofluoric acid. This may be replaced by a 10-per cent. solution of hydro-fluosilicic acid at the rate of 5 c.c. of the solution to each litre of the raw latex. The acid salts of these acids, such as potassium and sodium fluoride, potassium, sodium or zinc silicofluorides, either in the solid state or in solution, may be employed for the purpose.

The chief advantage of this process is to reduce considerably the amount of impurities in the rubber; these are retained to a great extent by the settlement of the heavier among them during the process of coagulation. In addition to this, hydrofluoric acid, being an antiseptic body, kills all putrefactive germs; rubber prepared by its aid never becomes viscous. Smoked rubber possesses this characteristic as well, but the smoking process adds impurities to it, and makes it black in colour. In the Purub process, this is all avoided, and there are the additional advantages that it is more speedy and requires less labour. There are other advantages, too, in that all injurious organisms are destroyed, even in the interior of the coagulated mass, and there is no need to dry the rubber—a fact that is in accordance with Bamber's opinion, that rubber is better for a water content of 9 to 10 per cent.

MARKET REPORTS.

London,—The West India Committee Circular, April 12, 1910; Messrs. E. A. de Pass & Co., April 1, 1910.

Arrowroot—St. Vincent, $1\frac{3}{4}$*d.* to $3\frac{3}{4}$*d.*
Balata—Sheet, 4/8; block, 3/6 per lb.
Bees-wax—No quotations.
Cacao—Trinidad, 53/6 to 63/- per cwt.; Grenada, 50/- to 55/- per cwt.; Jamaica, 48/- to 53/6.
Coffee—Jamaica, 38/- to 120/-.
Copra—West Indian, £27 17*s.* 6*d.* to £28 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations: St. Croix West Indian, 20*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 10*d.* to 1/-; concentrated, £18 15*s.*; Otto of limes, 5/9.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Steady.
Pimento—Common, $2\frac{1}{8}$*d.*; fair, $2\frac{1}{4}$*d.*; good, $2\frac{3}{8}$*d.* per lb.
Rubber—Para, fine hard, 11/9, fine soft, 11/8; fine Peru, 11/6 per lb.
Rum—Jamaica, 2/3 to 5/-.
Sugar—Crystals, 19/3 to 21/-; Muscovado, 14/9 to 16/3; Syrup, 14/- to 16/6; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., April 1, 1910.

Cacao—Caracas, $11\frac{7}{8}$c. to $12\frac{3}{8}$c.; Grenada, $11\frac{5}{8}$c. to 12c.; Trinidad, $11\frac{3}{4}$c. to $12\frac{1}{4}$c.; Jamaica, $10\frac{1}{4}$c. to $11\frac{1}{2}$c. per lb.
Cocoa-nuts—Jamaica, select, \$30·00 to \$32·00; culls, \$17·00 to \$18·00; Trinidad, select, \$28·00 to \$30·00; culls, \$17·00 to \$18·00 per M.
Coffee—Jamaica, ordinary, 9c. to $9\frac{1}{2}$c.; good ordinary, $9\frac{1}{2}$c. to 10c.; and washed, up to $11\frac{1}{2}$c. per lb.
Ginger—$9\frac{1}{2}$c. to 13c. per lb.
Goat Skins—Jamaica, 52c.; Barbados, 45c. to 47c.; St. Thomas, St. Croix, St. Kitts, 42c. to 43c. per lb.; Antigua, 45c. to 47c., dry flint.
Grape Fruit—\$2·25 to \$3·50 per box.
Limes—\$7·00 to \$9·00.
Mace—30c. to 36c. per lb.
Nutmegs—110's, $9\frac{1}{4}$c. to $9\frac{1}{2}$c. per lb.
Oranges—Jamaica, no quotations.
Pimento—$4\frac{1}{8}$c. to $4\frac{1}{4}$c. per lb.
Sugar—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid

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Trinidad,—Messrs. Gordon, Grant & Co., April 16, 1910.

Cacao—Venezuelan, \$12·00 per fanega; Trinidad, \$11·40 to \$11·90.
Cocoa-nut Oil—94c. per Imperial gallon
Coffee—Venezuelan, 10c. per lb.
Copra—\$4·40 per 100 lb.
Dhal—\$4·35 to \$4·40 per 2-bushel bag.
Onions—\$3·75 per 100 lb.
Peas, Split—\$6·50 to \$6·60 per bag.
Potatos—English, \$1·50 to \$1·60 per 100 lb.
Rice—Yellow, \$4·50 to \$4·60; White, \$4·75 to \$4·80 per bag.
Sugar—American crushed, \$5·10 to \$5·20 per 100 lb.

Barbados,—Messrs. Leacock & Co., April 25, 1910; Messrs. T. S. Garraway & Co., April 25, 1910; Messrs. James A. Lynch & Co., April 18, 1910.

Arrowroot—St. Vincent, \$3·40 to \$3·75 per 100 lb.
Cacao—\$12·00 to \$13·00 per 100 lb.
Cocoa-nuts—\$14·00.
Coffee—Jamaica and ordinary Rio, \$10·00 to \$11·00 per 100 lb., scarce.
Hay—\$1·20 to \$1·25 per 100 lb., dull.
Manures—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
Molasses—No quotations.
Onions—Bunched, \$2·28 to \$3·50 per 100 lb.
Peas, Split—\$6·20 to \$6·75 per bag of 210 lb.; Canada, \$3·45 to \$3·60 per bag of 120 lb.
Potatos—Nova Scotia, \$2·00 to \$2·75 per 160 lb.
Rice—Ballam, \$4·33 to \$4·80 (180 lb.); Patna, \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, April 16, 1910; Messrs. Sandbach, Parker & Co., April 15, 1910.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$8·00 to \$8·25 per 200 lb.	\$8·00 to \$8·25 per 200 lb., market dull
Balata—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
Cacao—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	\$6·00 per barrel of 196 lb.	No quotation
Cocoa-nuts—	\$12 to \$16 per M.	\$16 per M., peeled and selected
Coffee—Creole	12c. to 13c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14c. to $14\frac{1}{2}$c. per lb.	$14\frac{3}{4}$c. to 15c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	\$4·25 per bag of 168 lb.	\$4·25 per bag of 168 lb.
Green Dhal	\$5·75	——
Eddos—	\$1·04 per barrel	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	No quotation
Madeira	——	No quotation
Peas—Split	\$6·40 per bag (210 lb.)	\$6·40 per bag (210 lb.)
Marseilles	\$3·50	\$3·50 to \$4·25
Plantains—	24c. to 60c. per bunch	——
Potatos—Nova Scotia	\$1·75 to \$2·00	\$1·75 to \$2·25
Lisbon	No quotation	No quotation
Potatos–Sweet, Barbados	\$1·44 per bag	——
Rice—Ballam	No quotation	\$4·75
Creole	\$4·00 to \$4·20	\$3·70 to \$4·00
Tannias—	\$1·44 per bag	——
Yams—White	\$2·40	——
Buck	\$2·40 per bag	——
Sugar—Dark crystals	\$3·10 to \$3·15	None
Yellow	\$3·60 to \$3·70	\$3·70
White	\$4·00	\$3·80 to \$4·00
Molasses	\$2·25 to \$2·50	None
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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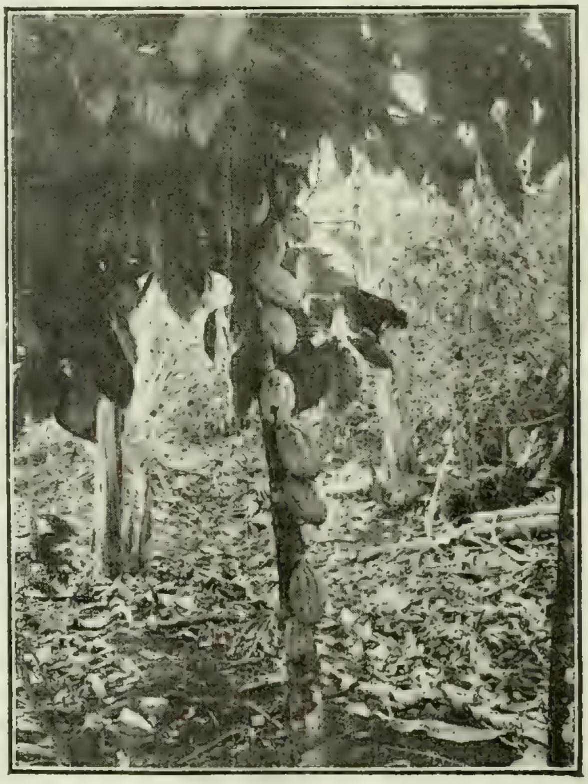

AGRICULTURAL NEWS

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OF THE
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CONTENTS.

The Functions of Agricultural Experiment Stations.

II. IN PRACTICAL AGRICULTURE.

IN the definite work of an agricultural experiment station, besides that connected with research, a consideration of which has already been given, there are included lines of investigation that are conducted, broadly speaking, in two ways. The first of these has relation to experiments which are designed to give a purely empirical result; that is to say, the effort is made to obtain information as to the nature of the right procedure in any given matter, while there is no arrangement of the details in such a way that scientific reasons will be supplied for the conclusion which is reached. The second kind of investigation includes experiments, in themselves apparently simple, which, while giving results of practical value, afford at the same time information that has a use in relation to what are usually termed purely scientific considerations. It does not require any demonstration that the latter way of experiment is the more valuable, especially as it leads to greater certainty in formulating and applying results of general agricultural importance; the tendency is therefore to give all investigations a scientific aspect.

Dealing with the work of the experiment station in a more detailed way, it is generally the case that a large part of this is taken up with manurial and tillage experiments. The latter include the introduction of new methods and machinery in connexion with cultivation, but this is a matter where a large part of the investigation should be performed by the planter, on his own land. Fresh importations, too, will take place under its direction, in relation to crops, in order that those who are interested may be given opportunities of trying new and improved varieties of plants, while the station itself will devote some of its efforts to the improvement of those already existing in the area which is to benefit by its operations. An important part of the work of many stations is the making of experiments which are maintained over several years, and the existence of these gives an argument, among several others, for the continuance of the form of their

labours, as originally adopted, during long periods, and indicates the great care that should be exercised in the planning of such institutions.

The success of the educative work of a station is dependent mainly on its power to keep in close touch with the practical agriculturist. This is chiefly done by means of the initiation of lines of experiment that, of necessity, require his co-operation, and it is here that the work of sub-stations possesses one of its greatest values. At these, the planter is afforded an opportunity of viewing closely some of the work that is being done for him, and it is by means of them that the solution of detailed, local problems is afforded, although his advisers will be, at the same time, fully cognisant of their relation to the broad principles of agricultural science. Another way in which the planter is reached is by the publication of results and advice. The printed matter which is the outcome of this will be made to present its information in two ways: there will be the detailed results, together with the deductions that may be made from them. Experience has shown that the best plan to follow in such work of publication is to issue, in addition to the report which contains particulars of all the work, including the minutest statistical details of experiment, a short account which will present the results of the work briefly and succintly. It is with this object that a certain proportion of the numbers of the Pamphlet Series is issued by the Imperial Department of Agriculture. Where there are several stations whose efforts are correlated to a large degree, and which are administered by one authority, it is best that all such work of publication should be centralized, with a view to the reduction of the labour and expense of producing the printed matter, and to giving those in charge of the stations more time for the attainment of the definite objects of their labours.

These outward manifestations of the energy that is being employed in the conduct of an experiment station are dependent most largely for their efficiency on the work of its internal organization. There is evidenced in this the necessity for the existence of system in procedure and the observance of regularity. Each officer should possess definite routine duties, for the performance of which he is directly responsible, but should, withal, approach his work in an attitude of mind which will lead to a readiness to interest himself actively in any matter that those who direct his energies may consider to be one on which he may fittingly expend them. This precision should arise naturally from the definiteness of the work which is being done at the station. Added to this definiteness, such work should possess well-considered limitations; there is a danger of making it too comprehensive. Good, clearly appreciated results in the matters of greater import are of more value than the somewhat indefinite ideas which will be the outcome of work over too wide a field of enquiry.

Particular attention is merited in the matter of taking and compiling the routine records of a station; this work should be organized in such a way that its continuity is assured in what may be almost termed an automatic manner. Much of it will be attended to by the younger workers at the station, and it will serve to increase their interest in the matter if they are put in the way of acquiring such knowledge as will enable them to appreciate its usefulness and to arrive at right interpretations of the information which it gives. This care to gain the interest of the younger worker should not, however, be confined to these affairs alone, especially now that the experiment station has fallen into a natural place in the scheme for the agricultural education of those who will be employed in a directive capacity on estates; his instruction, in a sympathetic manner, should form part of the work of those who direct his energies, and he, himself, should realize strongly that he has a duty in the direction of the continual pursuit of such studies as will make him more efficient.

Returning to the consideration of the experiment station in a general way, it is fittingly pointed out here that such an institution is not a model farm. Its aim is to gain information in regard to the life of plants, and to the relation of the plant to surrounding influences, including that of the soil; in this manner its usefulness is extended as widely as possible. In the same way, it is not a mere information bureau. One of its duties, certainly, is to supply answers to questions propounded by those who are in need of agricultural advice, but this is not the end and aim of its being. There is often a need for a broader view of the reason for its existence, both on the part of those who direct it, and of those for whom it exists, and the acquirement of this will lead to its widened efficiency.

In its infancy, the experiment station scheme was employed in such a way as to be merely of direct practical use to the agriculturist, and this was wise, for such a policy served to gain his confidence and often his support. The time has arrived when this restricted view must be modified. The aim of those who manage the station must be high, and the attitude of such as use it must be broadly sympathetic. Under these circumstances, only, will it progress to the stage of greatest general utility.

SUGAR INDUSTRY.

THE INFLUENCE OF THE STRUCTURE OF SUGAR-CANE ON MILL WORK.

The Experiment Station of the Hawaiian Sugar Planters' Association has recently issued its thirtieth bulletin under the title of *The Influence of the Structure of the Cane on Mill Work in Sugar Factories*, by Noel Deerr. As is stated in the introduction, this is divided into three parts: a discussion of the influence of the different juices contained in the cane on control work; an account of some experiments made with the object of determining the effect of different methods of extraction; and a consideration of the cane as being composed of pith and rind, so that these are regarded as separate entities when dealing with the results of milling operations.

The first part commences with the consideration of the inferential method of controlling the weight of cane entering the factory which is due to Geerligs, namely that the percentage of sucrose in the cane, divided by the percentage of sucrose in the first mill juice, gives the constant quotient 0·85, under certain fixed conditions. As the author points out, it is evident that this can only hold under constant circumstances of mill pressure and fibre content of the cane: as the proportion of juice obtained from the cane increases, and at the same time approaches more nearly the composition of all the juice contained in the cane, the value tends to increase; its value will become smaller, on the contrary, with an increase in the fibre content of the cane. This was recognized by Geerligs, and attention is drawn to a table which was constructed by him for the purpose of giving the various values of this quotient with different mill pressures and fibre contents, in the case of the Cheribon cane. Other investigators found different values for the various canes that were used under the conditions with which they had to deal, and this led the author to determine those for the chief canes employed for sugar-making in Hawaii: these are given in the bulletin, and it is shown that the quotients for Hawaiian canes are very similar to those for the Cheribon cane. The practical use of the figures obtained is to indicate that, in factories where the sucrose content of cane is determined by working back from the sucrose in mixed juice and that in megass, a low value will show that either the weight of cane recorded is too high, or that the measurement of the amount of juice is inaccurate.

In employing his experiments to find the values of the quotient of which mention has just been made, the author worked out the ratio between the solids in what he terms the 'absolute' juice of the cane and those in the expressed juice. By the absolute juice, he means 'everything which is not left behind on extraction with water', so that this term includes protoplasm, together with the 'colloid water' of Geerligs, and the 'water other than juice', as it is described by Dr. Francis Watts (see *West Indian Bulletin*, Vol. IX, p. 85); that is to say, absolute juice comprises the sugar-bearing juice of the cane, as such, protoplasm, and what is usually understood by 'imbibition water', in a botanical sense. Returning to the relation just referred to—that between the solids in the absolute juice, as defined, and those in the expressed juice—it was found that this was far more constant than the quotient which was first under consideration, namely, that obtained by dividing the percentage of sucrose in the cane by that in the first mill juice. This is shown by the fact that, for at least three varieties of cane, with a fibre content varying from 10 per cent. to 14 per cent., it was found to lie between the values 0·97 and 0·98. The practical development of this is that, if the density of the absolute juice of the cane is known, then, with the usual results of analysis alone, all the essential measurements relating to mill control can be expressed in terms of cane: and if either the weight of cane, of megass, of mixed juice or of added water has been determined, all the other quantities can be found. It is not suggested that the making of direct measurements should be discarded in favour of an inferential method: but that the latter should form a means of checking such measurements, and the author proposes, in the light of the determinations made by him, that the value of the ratio employed for the purpose should be 0·977, laying stress at the same time on the necessity for accuracy in the determination of the total solids in the megass, before reliable results can be obtained.

As has been stated, the second part of the bulletin deals with the effect of different methods of extracting juice; the difference of these methods consisted in using nine and twelve-roller mills, maceration with hot and cold water at different stages in the milling, returning or not returning the dilute juice, and the application of increasing extractions. It was found that the highest extraction was obtained when the water was added in divided quantities: the result was lowest when its addition took place before the last mill, and was intermediate when it was divided before the second and third mills. There was little difference found, whether the water was hot or cold; a slight advantage obtaining when it was hot was probably due to the slightly greater dilution. The comparison of the work of a nine-roller and a twelve-roller mill led to the conclusion that, making allowance for difference in fibre content, the latter effects extraction from 50 tons of cane per hour as well as a nine-roller mill dealing with 35 tons in the same time, with a dilution in the case of the larger mill, of 12 per cent. instead of 34 per cent. It is the author's opinion that the matter of chief importance in these trials is the economy effected in the case of the twelve-roller mill, as a result of the greater quantity of cane dealt with and the smaller amount of liquid to be treated, on account of the lessened dilution. In the last connexion, it was not found that any approach to equality of final efficiency of work in the two cases could be obtained by using less water: the effect was rather to gain very inferior results with the smaller mill.

The object of further work was to ascertain the influence of high extraction on the purity of the juice; in other words, to find the effect of expressing increasing quantities of juice from the cane on the amount of sugar that could be obtained. The average results of experiments showed that an extraction of 93·0 may be considered to correspond with a purity of 89·0, and an extraction of 87 with one of 90·6. By interpolating values and extending the extraction numbers to 95·0, a table is obtained in which, while the latter increase by unity, those representing the purity decrease by 0·2 in the first, fourth and seventh steps, and by 0·3 in the others. Thus extractions of 90·0 and 95·0 correspond, respectively, to purities of 89·8 and 88·5, so that increasing the extraction from 90 to 95 does not increase the amount of sugar that can be obtained in the ratio of 95 to 90, but in that ratio multiplied by the quotient obtained by dividing 88·5 by 89·8. In other words, the increase in available sugar, calculated from the extraction alone, would be 5·6 per cent.; it is actually 4 per cent. The subject is developed by the author, who, however, in view of the conditions peculiar to any given factory, does not deal with the financial aspect of high extraction, but leaves the data brought forward by him to be worked out on the basis of money units in any special case.

The third part of the bulletin, namely that which treats of the effect of the structure of the cane on mill work, will be dealt with in the next number of the *Agricultural News*.

WEST INDIAN FRUIT.

THE YIELD FROM CACAO TREES.

The following information is taken from the articles on cacao by J. H. Hart, F.L.S., that are appearing in the *West India Committee Circular*. Reference has been made already to these in the *Agricultural News*, Vol. VIII, pp. 260, 292 and 340. In the first case, the information consisted of a summary of a table in which the characteristics of the different varieties of *Theobroma Cacao* and *T. pentagona* were given; in the second, it related to the soils that are most suitable for the cultivation of cacao; while in the third, an account of the best methods of manuring, and of the treatment of the soil, was included.

It should be mentioned that in the table below, as it was originally given, the yield from each of the twelve trees on which observations were made was presented: this has been omitted here.

The yield per tree depends, firstly, upon the character of the tree, and secondly, upon the quality of the land in which it is planted. Some trees naturally yield more than others, as may be seen in fruit orchards in any part of the world, the aim of the cultivator being to secure a class which yields well. How to secure such trees has already been discussed. That yield can be increased by manuring is certain, where the condition of the soil is such as to allow it: but to force trees with too much manuring tends to shorten their period of existence. The use of sufficient manure is good practice; that of over-abundance is bad. The yield per 1,000 trees is probably the best test of the value of estates, especially if the records have been reliably kept, and the seller is able to give authentic reference to crops harvested during a period of years.

Trees of the same size, planted side by side, will largely differ in yield when only seedlings are used. The maximum yield of some seedlings will not be more than 1 lb. of dry cacao annually, while others have been known by the writer to yield as much as 15lb. 3 oz., annually, of dry cacao, and others have recorded as much as 30 lb. per tree. From this it has been deduced that, given trees of special character, the annual crop might be easily increased.

In the *Bulletin of the Botanical Department*, Trinidad, April 1907, I asked the question: What is the possible crop of a tree in full bearing? It was also suggested that careful observations should be made by planters, under which the number of pods picked from selected trees should be recorded. This was taken up by a leading Trinidad planter, and the following table gives the results obtained:—

Yield of Cacao from Twelve Trees.

Date Harvested.	Total number of pods harvested.
1907.	
January 3	176
April 2	202
,, 24	64
May 23	134
June 24	321
July 22	249
August 27	26
September 24	37
October 22	63
November 12	99
December 3	139
,, 17	307
Year's total	1,817
1908.	
January 3	533
,, 9	361
February 20	344
Total	1,238

The table showing a year's produce from selected trees, being an actual yield, is strong evidence that progress on the lines of selection of prolific and disease-resisting kinds will be the best means of increasing the annual yield, and that there is a very large margin between the yield per tree here found and that with which estates are at present credited. If trees under ordinary culture can produce the yield of our table, it is surely possible, given well-planted trees of the same character (produced by budding or grafting), to increase materially the annual yield, leaving out all reference to increase by manuring.

The period of growth of a cacao pod from flower to maturity extends from four and a half to five months, that is, from the opening of the flower to the ripening of the pod, but this period may be extended, owing to the facility with which the ripened pods remain in that state upon the trees, for some days or even weeks after they have reached full maturity. It is not good practice, however, to allow them to remain too long upon the tree, or the quality of the produce will suffer considerable deterioration. If they remain much too long, it will be found that the seeds have begun growth in the pods, and instead of marketable material, there will be nothing but a mass of matted roots. If they commence to

grow and the radicle or first root pierces the 'shell' of the seed, it leaves an aperture which allows of the entrance of mould fungi while drying, and thus lowers the value of the sample. The facility with which pods hang for a time upon the trees without hazarding quality assists generally the economy of the harvest work.

Yield clearly depends, first, upon the kind of tree cultivated: secondly, upon the richness of the soil or the natural amount of plant food available: thirdly, upon the artificial supply which may be applied; and last, but by no means least, the amount of skill which is brought to bear by the cultivator in maintaining conditions suitable for the production of large crops.

There are diverse opinions as to methods to be adopted for securing this result, among which are first, the abolition of the use of shade; second, the adoption of seminal selection: both of which have been recently advocated (1910) in Trinidad. These points and others more advanced have been fully discussed in preceding pages, but our suggestions may be again stated briefly:—

(1) The selection and standardization of certain types of cacao, and the propagation of these by budding or grafting as in fruit orchards.

(2) The abandonment of propagation by seed, on account of the excessive variation that occurs under any method of seminal or seed selection; that is, the trees cannot be made to come true from seed.

(3) By better systems of cultivation and preparation.

PRIZE-HOLDINGS COMPETITION IN DOMINICA.

In 1908-9, a Prize-holdings Competition Scheme was commenced in the La Plaine District of Dominica, when seven peasant proprietors competed, and three prizes were awarded. According to a report by the Curator of the Botanic Garden and Experiment Station, Dominica, this has been followed by a competition in 1909-10. In this, the number of plots entered was twenty-two, fourteen being in Class I, which consists of holdings containing between one and 4 acres of bearing cacao, and eight in Class II, which includes holdings containing between 100 trees, and such numbers as will occupy an area of 1 acre, planted at proper distances apart. The scheme had been carried out through the assistance of Mr. Alexander Robinson who had consented to undertake the duties of local instructor, and the improvements that have been effected in cacao cultivation in this district are largely due to Mr. Robinson's influence, especially in the matter of bringing about the employment of better methods of planting, and caring for the trees. The result has been that, at the present time, pruning is done carefully, attention is given to drainage, and adequate manuring and mulching are effected.

The varieties of cacao grown are Forastero and Calabacillo, with various kinds intervening, which have arisen from the cross breeding of these types. The trees were found to be remarkably free from disease: there was only an uncertain trace of 'canker' or 'die-back'; pod diseases were rare, and there was only one case of root disease. This absence of disease is due largely to the hardiness of the cacao grown, and it is suggested that no attempts to improve the quality of the product by the introduction of Criollo and Alligator cacao should be made, but that improvements should be effected by selecting the best kinds now growing in the district and grafting them on to hardy stocks. The trees used for wind belts are Pois-doux (*Inga laurina*), galba (*Calophyllum Calaba*), Bois d'Inde (*Pimenta acris*), as well as other native trees. It is intended to introduce the Nicaragua shade tree (*Gliricidia maculata*) into those parts of the district where it will be useful.

The prizes gained are as follows: in Class I, one first, one second, one third and three fourth prizes: eight persons shared in them on account of the fact that there were two pairs of co-owners. In Class II, there were five prize winners, one in each of the degrees first second and third, and two in the fourth.

The names of the prize-winners were:—Class I, first prize, Sadoc Laronde; second prize (divided) J. B. Bertrand and F. W. Bertrand; third prize (divided), Camille Barry and Duke Barry: fourth prizes, A. Stedman, A. Lawrence, E. Laudat. Class II, first prize, Emile Lawrence: second prize, Ernest Eloir; third prize, Robinia Didier; fourth prizes, William Laronde and Octave Oscar.

It may be mentioned that the object of the competition is to bring about improvements in the planting and management of cacao trees at La Plaine, which is a district occupied entirely by small land owners whose chief crop is cacao.

USES OF THE TONKA BEAN.

A short account of the Tonka, Tonga, or Tonquin bean (*Dipteryx odorata*) appeared in the *Agricultural News*, Vol. V, p. 212. The information which follows as to its uses is taken from *L'Agriculture Pratique des Pays Chauds* for December 1909:—

The Tonka bean is employed in considerable quantity in the United States by makers of tobacco and snuff. The beans are ground to powder and mixed with ordinary tobacco. As this operation is not legal, it is performed secretly, and in such a way as to prevent the proportions in which the mixture is made from being found out. The makers of vanilla extract also use it. It is mixed by them with vanilla to a proportion of 5 to 10 per cent. This mixture, however, is of mediocre quality, because the odour of the bean almost disguises the perfume of the vanilla. On account of the Pure Food Law, the name of this mixture is placed on the market under the name of 'Vanilla Compound'. Makers of perfume also use the Tonka bean in mixtures of which they alone possess the secret. It is employed especially in the manufacture of soaps and perfumes known under the name 'd'Héliotrope Blanc'. The bean, made into 'Tincture of Tonka', finds an outlet among pastry cooks and confectioners on a large scale, as a substitute for vanilla, but it is not permissible to apply the name 'vanilla' to such products. Finally, the Tonka bean, mixed with other ingredients, apparently enters into the composition of certain whiskies.

As a matter of fact, the use of the Tonka bean, as a substitute for vanilla, has become illegal in the United States. Manufacturers are therefore bound to make mention of its presence in those products which they sold formerly under the name of vanilla products in order to attract custom. In 1907, imports of the bean took place to the value of $116,102; in 1908 they were worth $10,519. This diminution in the imports corresponds exactly to the time of application of the Pure Food Law.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 25, with reference to the sales of West Indian Sea Island cotton :—

West Indian Sea Islands have been in moderate request at steady rates, and the business includes Barbados 17*d.* to 22½*d.*, Nevis 20*d.* to 22½*d.*, St. Vincent 21½*d.* to 23*d.*, Antigua 21*d.*, St. Kitts 20*d.* to 21*d.*, and Montserrat 20½*d*

The recent decline in Egyptian cotton may probably adversely affect the price of Stains and the lower qualities of West Indian generally, but not the medium and better sorts.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 16, is as follows:—

There has been only a moderate demand below the views of the factors, therefore the market remains quiet, with the unsold stock as last reported, consisting principally of Planters' crop lots held at 40c., 50c., and 60c.

VARIETIES OF COTTON CULTIVATED IN NYASALAND.

It has been found from experience that Egyptian varieties are unsuitable for elevations over 2,500 feet, and therefore this kind of cotton, which at the advent of cotton cultivation in the Protectorate was widely spread, is now practically confined to the estates of the lower and upper river, and the more favoured districts bordering Lake Nyasa.

Nyasaland Upland is the most extensively cultivated cotton, and may be described as a long staple Hirsutum cotton, similar to the long staple varieties grown in the Mississippi valley. Experiments have been made with Kidney, Brazilian and Caravonica cottons, with indifferent results, and trials are being conducted with Allen's long staple and Griffin. The latter two varieties show a great tendency to form sports, but systematic selection is being carried out; it is hoped to develop fixed types of those two high quality cottons.

Selection is very necessary to improve the yield and lint percentage; the Upland cotton now averages 27 per cent., although individual plants selected by the writer give lint percentages as high as 38, showing the possibility of profitable work in this direction. It means much to the grower when every hundred pounds of seed cotton picked yields the higher instead of the lower figure. Selection applies not only to lint percentage, but to all other qualities, such as prolificness, length, strength and quality of lint. The lint percentage in the Egyptian cottons examined is slightly higher than in Nyasaland Upland, and the highest percentage for Egyptian was a sample of native grown cotton from the Port Herald district, which gave 34·60 per cent. (Leaflet No. 4 of the Agricultural and Forestry Department, Nyasaland Protectorate.)

Cotton-Growing in Siam.

The British Vice-Consul at Bangkok reports that the amount of cotton now grown in Siam is very small, but that at one time it was probably considerable. Cotton is still produced in many places on the edge of, and outside, the central plains, but this is a mere remnant of the industry, which must have once supplied the population with most of its clothing.

Gossypium herbaceum in some variety is grown, and several other species have been noted, especially one grown in small quantities in the south, the produce of which is used only in connexion with Mohammedan burial; this last is probably of Persian or Egyptian origin. Nearly 10,000 piculs (about 12,000 cwt.) of cotton were exported to Hong Kong in 1908-9, but this was probably tree cotton, and it is not likely that any annual cotton is exported, except a little overland.

In 1905-6 some experiments in cotton-growing were begun at Pharapatom, cotton seed from Chiengmai, Korat and other places, as well as local seed, being used. The greater part of the seed was bad, but the Korat and local seed germinated and grew. The experiment was carried far enough to show that the staple was poor, and that the bolls were peculiarly liable to attacks from weevils, beetles and other insect pests. It is probable, however, that cotton could be successfully grown in those parts of the country which combine a rich, light soil with dry weather. (The *Board of Trade Journal*, January 27, 1910.)

Cotton and Climate.—The following information in connexion with the effect of climate on cotton appears in the *Report of the Agricultural Research Institute and College*, Pusa, 1907-9:—During April and May, 1907, an extensive enquiry was made regarding the varieties of cotton and the conditions under which the cotton crop is grown in Gujerat and Kathiawar. In Surat and Broach districts, the quality of the cotton is best in the south, and gradually gets worse as one proceeds northwards. Navasari has the finest and longest staple, then comes Surat, and then Broach. This may be due to the heavier rainfall and greater atmospheric humidity at Navasari (owing to its proximity to the sea), for there is little apparent difference in the soil.

THE RECENT CONGRESS HELD AT MANAOS.

The report of the conclusions reached at the Commercial, Industrial and Agricultural Congress held at Manaos on February 22 to 27, 1910, has been received recently. The Congress was divided into three sections, connected with commerce, the rubber industry and general agriculture, respectively. The following is an account of the chief recommendations that were made.

As regards general commerce, it was resolved to recommend that steps should be taken to improve the present condition of the workers on rubber plantations, especially in the matter of the reduction of tariff rates on the food consumed by these. In order to ameliorate the state of navigation and transport, it was resolved to petition the Government to give grants to encourage the exploration of unknown rubber-producing areas, as well as to award subsidies to such steamship companies of Europe and North America as will cheapen their rates and shorten the time of the voyages. With the same object, the removal of obstructions in the rivers, wherever this can be accomplished, was advised, as well as the exemption by the Federal Government from import duties of all vessels intended for the purpose of navigating the Amazon rivers. In order to safeguard the interests of the rubber industry, it was decided to ask that the Federal Government, together with the Legations in Europe and America, should urgently intervene in order to influence the Chambers of Commerce of various rubber-buying countries to take steps to ensure that rubber from the Amazon valley may be quoted according to its real origin, in agreement with the export manifest passed by the responsible authority at the port of shipment. Finally, various recommendations were made in connexion with the facilitation of communication and transport, chiefly in the direction of the organization of a model navigation enterprise, the construction of railroads and the extension of telegraph lines.

As regards the rubber industry more especially, the following measures were suggested for the purpose of stimulating the planting of this crop: the establishment of model plantations; free grants of land for rubber-growing; reduction of the import tax on rubber; publication of printed circulars containing advice useful on plantations; the distribution of planting material of *Hevea brasiliensis*. In order to ensure the further extension of planting, the policy of interplanting and replanting of the present areas, and the planting of the open clearings in the forest was recommended. As a means of determining that further areas may be taken up for the purpose of rubber production, it was considered advisable that the Federal Government should advertise largely such openings as could be obtained for the investment of capital, and that a uniform low price should be demanded for land intended for the rubber industry. In the matter of the kinds of rubber to be employed for the production, it was considered that *Castilloa Ulei* should be protected by special laws, and that the planting of Hevea should be encouraged in preference to that of all other rubbers, in view of the fact that more was known concerning this cultivation than about that of any other kind. The chief recommendations in the direction of the improvement in the collection of the latex and the preparation of rubber from it were as follows: to send an expert to those countries where Hevea had been successfully exploited, in order to ascertain the best methods of treatment; to establish model rubber cultivations of an educative character, under the management of competent persons, and having attached to them physiological and chemical laboratories; to advise the rubber growers to adopt better methods of coagulation; to ask the respective governments to grant exemption from import duty to any modern machinery intended for improving the present methods of tapping and preparing rubber and allied products in the valley of the Amazon; to condemn coagulation by means of acids or alum; to request urgently the Federal Governments of the States of Amazon, Para and Matto-Grosso, and of the neighbouring republics to enact repressive laws against all kinds of fraud in the manufacture of rubber; to urge the necessity of the organization of a series of well defined types of the different kinds of rubber, in order that classification may be facilitated.

In the general agricultural section, similar recommendations were made for crops other than rubber, and in connexion with the encouragement of stock-raising. One of these was that interest should be guaranteed for ten years on capital realized by national or foreign enterprises for the systematic planting of Hevea, the Government fixing the number of these undertakings. The minimum extent of planting in such undertakings should be 50,000 feet within five years, and a guarantee of interest would only be for the purpose of supplementing the rewards granted in accordance with other recommendations: the reward and guarantee together would not be more or less than the amount of the stipulated interest. Finally, it was decided to draw the attention of the Minister of Agriculture to the necessity of the provision of special delegates, in view of the great size of the territory, the difficulty of transport, and the time necessary for travelling from one port to another in the same state.

YIELDS FROM CEARA TREES WITH DIFFERENT KINDS OF TAPPING.

In Bulletin No. 19 of the Hawaii Agricultural Experiment Station, entitled *Experiments in Tapping Ceara Rubber Trees*, to which reference has already been made (see *Agricultural News*, Vol. IX, p. 107), an account is given of experiments which were conducted with a view to ascertaining the difference of yield of latex, when V cuts were employed, from that obtaining when the cuts were vertical. In the first trial, ten trees were divided into similar groups of five. It was found that the time required for making the different kinds of incision was the same, being about seven minutes for each group. The trees tapped with a V cut gave $2\frac{1}{8}$ oz. of dry rubber; those with the vertical cut gave $6\frac{1}{2}$ oz. The greater yield in the latter case is partly due to the fact that the length of the incision with vertical cuts is greater than that with V cuts. The rate at which the latex ran from the vertical cuts was greater than that from the V cuts; the amount of scrap rubber left behind was about the same in each case. The healing of the bark took place in the same time in each case, and there was no difference in the smoothness of the surface of the renewed tissue.

Another experiment was conducted with twenty-five trees, which were tapped for five days in succession, fourteen vertical cuts 6 feet in length being made during this time, in each case. The purpose of this trial was to ascertain if there is any economy in making more cuts per day, and in this way using up the bark of the tree in a shorter time. The result was that no advantage was indicated from the use of four vertical cuts daily instead of two. The total amount of rubber obtained from the tree was 12·3 oz., of which 6·2 oz. was good, dry rubber.

A further experiment with eight trees at the station gave results again in favour of the vertical cut. These were not affected by the employment of a water bag to wash the latex into the pan and to keep the wounds fresh.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

A second article on the Functions of Agricultural Experiment Stations forms the editorial of this number. It deals more especially with the work of these stations that is directly connected with practical agriculture.

An abstract of part of a bulletin recently issued, dealing with the effect of the structnre of sugar-cane on mill work, is given on page 147.

An interesting article on the yield from cacao trees is extracted on page 148.

On the next page there is an account of a recent prize-holdings competition, held in Dominica.

An abstract of a translation of the report on the conclusions reached at the Commercial, Industrial and Agricultural Congress held recently at Manaos, is given on page 151.

The *Report of the Department of Agriculture*, Trinidad, for 1908-9, is reviewed on page 154.

The series of articles on The Chief Groups of Fungi is continued as Part VI, on page 158. In this issue, the consideration of the Uredinales is continued, and the remaining groups of the Basidiomycetes are dealt with. It should be mentioned that Fig. 26 is reproduced after Tulasne.

It is with a profound feeling of sorrow and loss that we place on record the fact that His Majesty King Edward VII died at Buckingham Palace on May 6, 1910, at 11.45 p.m.

The sense of bereavement consequent on this momentous event must be felt equally deeply by all who owned His Majesty's allegiance, whether officially or privately.

Rainfall in Antigua.

The returns of the rainfall in Antigua for 1909 show that the greatest precipitation was recorded at the station on the dam at Wallings reservoir: this was 59·99 inches. Next in order were Big Duers, Wallings (Hill), Creek Side and Green Castle, with 58·18, 56·25, 54·81 and 54·80, respectively. The smallest rainfall was registered at Mannings, namely 27·36 inches. Next above this were Comfort Hall, Collins and Sion Hill, with 32·87, 35·36 and 36·23, respectively. The precipitation measured at Codrington Village, Barbuda, was 42·67 inches.

From a statement in the returns, it appears that the rainfall of the year may be considered to have been favourable: it closely approaches the average for the past thirty-six years. Its distribution has been fairly good, except for the small precipitation in March and September.

The greatest rainfall that took place in twenty-four hours was 2·41 inches on November 28. The precipitation for the year was 45·10 inches, which is 0·21 inches below the average for the thirty-six years from 1874 to 1909.

Tubers of Calathea Allouya.

Specimens of these tubers have been received recently from the Curator of the Botanic Garden, Dominica. In that island, they are known as Tokkee Tambo, and in Trinidad as Topee Tambou. These names are evidently a corruption of the French word Topinambour, meaning Jerusalem artichoke (*Helianthus tuberosus*). In forwarding them, Mr. Jones states that they occur wild in the forest, on the windward side of the island, and are grown on the edges of peasants' gardens, that is between the garden proper and the forest, where they are given little attention.

In the *Kew Bulletin*, No. 70 (1892), p. 244, it is stated that the root of this plant usually consists of a large ovate body, to which the tubers are loosely attached by strong fibres. The colour of the leaves is pale green: they are somewhat papery in texture, and are borne on long stalks. The flowers are pure white and the fruit is a 3-celled capsule containing three seeds.

The tubers are edible, and are boiled and eaten in the same manner as the ordinary potato. Their taste resembles somewhat that of the artichoke.

State Forestry in India.

An interesting paper on Indian State Forestry, by the late Inspector General of Forests, has appeared recently in the *Journal of the Royal Society of Arts*. According to this, the forests of British India yielded, in 1906-7, 4,400,000 tons of timber and fuel, 181,250,000 tons of bamboo, and minor forest produce to the value of £439,000. In addition, they supplied grazing to 13¾ million head of cattle, as well as free grants and concessions of timber, etc., to the value of £227,000. The total income was £1,776,000, and the total expenditure £937,000. Of the latter sum £66,000 was spent on roads, bridges and houses: and £115,000 in demarcation, improvement, extension and protection of forests.

Round Buildings for Agricultural Purposes.

Bulletin No. 143 of the University of Illinois Agricultural Experiment Station has just been issued, under the title *Economy of the Round Dairy Barn*. Much that it contains is applicable in a general way, not to dairy barns only, but to other agricultural buildings. The chief advantages of round buildings are their convenience, strength and cheapness. In the first case, where they are used for cattle-feeding, it is easier to get the food from a central supply to the cattle, than it is in the case of a rectangular building. Such structures are stronger, because the ability of the timber used in making them to resist compression is taken advantage of to the greatest degree. There is the additional fact, which is especially important in countries liable to hurricanes, that, owing to their circular shape, all exposed surfaces can withstand wind-pressure better than flat ones; there is no hold for the wind, such as that provided by the gable end of a rectangular building. In the third connexion, rectangular buildings were found to cost 34 to 58 per cent. more than round ones, according to their construction, in material used, with the same floor area, built of similar stuff.

Agriculture in Primary Schools, St. Lucia.

The Annual Report of the Inspector of Schools on the Education Department, St. Lucia, 1909, states that the second annual examination in agriculture at the primary schools, under the scheme by which the inspection of the school gardens is made by the Agricultural Instructor (see *Agricultural News*, Vol. VIII, p. 265) has taken place. In the absence of an Agricultural Instructor, Mr. R. Niles, Schoolmaster at the Agricultural School, was, with the approval of the Administrator, appointed examiner. Twenty schools were examined by means of an oral examination of about two hours in each case, partly on the work in the class room and partly on that in the school garden. The number of pupils presented for examination was 454, of which nineteen were girls.

In his report on the examination, the Agricultural Superintendent suggests that it would be useful, in relation to the school garden work, if a book was kept by the teachers in which details are recorded of the plants grown, the experiments performed, and the results obtained, as well as observations of interest that are made from time to time. He also states that the examiner's report shows that noticeable progress is being made in the work throughout the island.

The detailed results obtained at the different schools show that, out of the twenty examined, three gained over 90 per cent. (excellent) of the marks awarded for agricultural teaching and school garden, two 75 to 90 per cent. (very good), ten 50 to 75 per cent. (good), three 30 to 50 per cent. (fair), and two under 30 per cent. (weak and insufficient).

Labour Bureau in St. Vincent.

Toward the end of last year, a Labour Bureau was established by the Government of St. Vincent for the purpose of assisting to remove some of the difficulties that are being experienced in the matter of obtaining labour in that island. For the purpose of carrying out the scheme, a central office was established at the Police Station in Kingstown, with district offices at most of the country stations. The method of working is for the officers in charge of the district offices to telephone demands for labour that have been received during the preceding day: these are summarized at the central office, and telephoned later to the district offices. In addition, these demands are kept on record for at least seven days, by being entered upon a special form, which is posted at all the offices. Thus a scheme has been devised by which labourers requiring work may, on application at the police stations, learn where employment is to be obtained, or may if they wish, communicate particulars of the kind of work which they require to the police, thus improving their position as to the opportunities of obtaining employment.

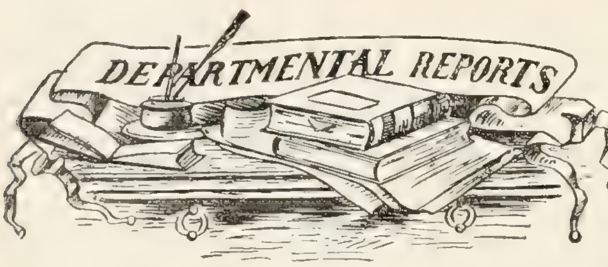
So far, little advantage has been taken of the scheme. This is due to initial difficulties, which are inseparable from such a plan in the West Indies, and to the fact that there is little or no provision of sleeping accommodation on estates, for labourers who have come from a distance.

Agricultural Conditions in Carriacou.

The Annual Report of the Commissioner, Carriacou, for 1909, shows that the work of the Experiment Station continues to be carried out on the same lines as in previous years. The lime cultivation has reached a stage at which it is indicated that arrangements could well be made for the manufacture of citrate of lime. No new scale insects of a destructive nature have been observed, but it is stated that the spread of 'love vine' (*Cuscuta* sp.) is taking place to a regrettable extent, in certain districts of the island.

From the cotton factory, 43,992 lb. of cleaned lint (146½ bales) was turned out during the year.

The rainfall for 1909 was 65·87 inches; that is 10·43 inches more than the one of 1908, and 32·43 inches in excess of that for 1907. This is interesting, in connexion with the development of the forest belt along the central ridge of the island, which has taken place since the reservation of this area, and it has acted in the direction of causing the extension of the planting of ground provisions by the peasantry.



TRINIDAD: REPORT OF THE DEPARTMENT OF AGRICULTURE, 1908-9.

This report, which was laid before the Legislative Council of Trinidad, on March 30, 1910, includes reports on the Botanical Department, the Government farms, the St. Augustine estate and the Government Laboratory.

In regard to the principal agricultural products of Trinidad, the report shows that the values of the chief exports were as follows: cacao £1,152,285, sugar £462,019, cocoa-nuts £57,284, bitters £27,194 and copra £16,862. The quantity of cacao exported was about equal to that of last year which was the highest on record. The sugar crop was below the average, on account of unfavourable climatic conditions, and through the attacks of the frog-hopper and the large cane borer (*Castnia licus*). Measures are being taken to deal with these pests as well as with canker, which is the chief disease on cacao estates. The progress made with cane-farming shows that this is continually becoming more firmly established. The amount paid to farmers for canes was $337,817; this was at the rate of $2·18 per ton. The quantity of cocoa-nuts shipped was the greatest on record, being nearly 4 million in excess of that of last year. The bud rot disease has been effectively dealt with, and the area under cultivation is being gradually extended. Cocoa-nut oil finds a high price locally, and this keeps the consumption within the colony.

In the matter of the chief fruits grown, namely bananas and oranges, although large quantities are raised, only a small proportion of these is exported. The reason for this, in the case of the bananas, is the high cost of handling and freight, as well as the likelihood of the product been spoiled during the voyage to its destination. Oranges have a small export only, on account of the unremunerative prices that are obtained at times.

Rice is grown, for local use, on an area of about 11,000 acres; this is increasing. In regard to rubber, information shows that a large number of trees have been planted in cultivations scattered through Trinidad and Tobago. Castilloa is the chief kind grown, and a sufficient number of trees have reached an age for tapping on a fairly extensive scale.

The exports of rubber from the colony have shown large fluctuations; in 1908-9 they were 2,146 lb., as against 4,444 lb. in 1907-8. The cotton industry in Tobago continues to show progress; though the area of the crop is not large, its quality is excellent.

The useful effect of agricultural education, which was introduced into the primary schools in 1900, and into the secondary institutions in 1905, is already showing itself. It is recognized, however, that the practical side of this education is eminently important; and in accordance with this, proposals are about to be submitted for schemes which include home reading courses and the creation of labour- and overseer-apprenticeships. Thirty teachers in elementary schools received instruction in agriculture by means of bi-weekly lectures; this subject is one of those which are compulsory in the annual examination of such teachers. In the secondary schools, each college takes agricultural science and chemistry for the Cambridge Senior, and Junior, Local Examinations, respectively. In the former subject, in the examination held in December 1908, fifteen out of thirty-one candidates satisfied the examiners; one with the mark of Distinction, eight with Good, and six with Moderately Good. At the same time, in chemistry, eleven candidates out of thirty-six passed. The percentage of success was not greater, on account of the fact that for a pass it is necessary to obtain a requisite number of marks in both the theoretical and the practical part of the examination, so that several pupils, though they passed in one part of it, did not appear on the list of successful candidates.

The Government Farm, which was instituted in 1879 for the primary purpose of ensuring a cheap supply of pure milk to the Colonial Hospital, appears to have fulfilled this object successfully. This is also the case with the subsidiary object of the farm; that is the improvement of the horned stock of the colony. In this connexion, the best results have been obtained in the matter of crosses between the Zebu and the native cow, and in the introduction of the buffalo as a draft animal. There are indications that the milking qualities of the stock in the island should receive special attention with a view to their improvement. At the Tobago Farm, the best results that have been gained are in breeding mules, pigs, and poultry, and it is estimated that the value of the mules born in Tobago is now about $10,000.

The part of the report which deals with the Royal Botanic Gardens shows that the crops of rubber and coffee have made fair progress during the year. Of the former plants, *Funtumia elastica* and *Hevea brasiliensis*, and of the latter, *Coffea robusta*, *C. excelsa* and *C. stenophylla*, are the chief species that are grown. The demand and the distribution of budded citrus and grafted mango plants have been large, and arrangements are being made for the production of grafted cacao.

In Tobago, the cotton ginnery has done satisfactory work, though an improvement might be effected by the substitution of an oil engine for producing power, in the place of the present one At the Botanic Station, the work has been carried on in accordance with the routine of former years. The chief attention has been given to the encouragement of the cultivation of useful plants, the production of improved varieties, the agricultural show, the distribution of plants, lectures of an educative nature, and assistance with school gardens.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated April 29, 1910, gives information as follows:—

The weather during the fortnight has been fairly dry, and reaping of short crop paddy in most districts will be finished by next week. Crop being reaped is reported light.

Rice still continues to come to town pretty freely, but another month should see most factories closed down.

Prices remain firm, and we look for an increase in the near future.

Shipments to West Indian Islands during the fortnight amounted to 5,673 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally 17*s.* to 18*s.* per bag of 180 lb. gross.
16*s.* to 17*s.* ,, ,, ,, 164 lb. ,,

POULTRY NOTES.

THE BREEDING AND REARING OF TURKEYS.

Leaflet No. 229 of the Board of Agriculture and Fisheries has just been issued, under the above title. As it contains much that is of interest in relation to West Indian conditions, this has been extracted:—

Although turkeys may be raised on heavy land, the operation is difficult, particularly in a wet season, and as a rule they do better on light soils, except in very dry weather, when there may be some deficiency in the green food. The best results are obtained upon a rich soil, which is not absolutely heavy in character.

The natural instinct of adult turkeys is to roost in trees, but this is not always permissible. Delicacy and disease, however, are the direct result of badly ventilated or overheated sleeping quarters, and a special form of house is necessary for the proper accommodation of turkeys. Although some special features are essential, the construction of a suitable house is really very simple. In common with all forms of fowl houses, the floor should be dry and the building rainproof and free from draughts. The roof should, if possible, be thatched. The arrangement of the perches is important; they should be broad, but not too broad for the birds to grip, and must run from end to end of the building.

Turkeys always prefer to remain on their perches until let out in the morning, when it is their habit to fly straight out and alight on the ground at some distance in front of the house. For this reason, and to prevent the birds from damaging themselves, the whole of the front of the house must be made to open with folding doors or gates consisting of strong frames, hung on hinges and covered with wire netting. It is only from stock housed in a healthy open-air manner that a healthy progeny can be expected. An excellent house can be made of a thatched shed with walls of wattled furze.

Many failures have been primarily due to inbreeding and the use of immature stock wanting in stamina. The use of well-bred and well-grown cocks for mating is of the first importance, and close breeding should be avoided. Well-grown birds for breeding are not necessarily of great size. An approximation to 20 ℔. in the males and 15 ℔. in the females would be suitable weights for ordinary breeding purposes, other considerations including width of shoulders, contour of breast, and a medium length of leg. The stock birds should be preferably from two to three years old, and from six to eight hens may be run with a vigorous cock, although a more usual proportion is four or five hens. One service is usually sufficient for the fertilization of a batch of eggs, but permanent mating is preferable.

During March, the hens require watching, or they will choose some out-of-the-way spot in which to nest. It is advisable to place boxes or barrels on their sides in sheltered positions, in which the birds may lay. April is the best hatching month, and it is generally inadvisable to continue hatching beyond June; but although late birds have insufficient time to come to full maturity, they may be disposed of as poults. Turkey hens are usually good mothers, but their eggs may also be hatched under ordinary hens. Artificial methods of hatching and rearing are not recommended, though incubators are frequently used at the time of hatching. A turkey hen will cover from fifteen to sixteen eggs, and a large barn-door hen from eight to ten. The period of incubation is twenty-eight days. The nests should be upon an earth bottom, and the general arrangement should be similar to that in the case of ordinary hens' eggs.

For the purpose of rearing, the principle of the roost house should, as far as possible, be applied to the coops, the doors of which should be wire netted, and covered with sacking in severe weather if necessary. The birds should be cooped with their natural or foster mothers upon short turf in a dry, sheltered position; a rich medium soil is the most suitable for them. The coops must be moved a short distance daily to a fresh patch, and the hens allowed out with the young birds when possible.

TO JUDGE THE AGE OF A FOWL.

In the case of a pullet, the surface under the wings will always be found interspersed with minute rose-coloured veins, which are totally absent in birds that are more than twelve months old. Again, there will be found, with pullets, a fair supply of long, silky hairs, which disappear directly the first moult is concluded. In the adult hen, the skin will be found to be perfectly white, and free from either veins or hairs; hence it is easy, at a single glance, to estimate correctly whether a bird is under or over the age that acts as a line of demarcation between juvenile and adult stock. Additional evidence is forthcoming in the formation of the pelvic bones which, in a pullet, are much closer than in the hen that has passed the pullet age. At two years they are much wider than at one year, so that birds at this age can be readily distinguished from those of, say fifteen and eighteen months. The third point of difference is observable in the shanks and claws. In the young bird, the skin of the claw is supple, and the scales are thin and brilliant. The skin gets coarser and stronger and the scales harder, as the bird grows, and the nail of the first toe, which does most of the work, gets much worn. There is also a difference in the eyelids. These acquire wrinkles as the bird gets older, and there is also a slightly shrivelled look on the face. This with age, becomes more and more pronounced. Lastly, there is the question of wing feathers—the most infallible test of all. At the conclusion of the first complete moult, which takes place when the fowl is exactly twelve months old, the secondaries alter in shape, and bear indisputable evidence as to the dividing line having been crossed. Although the surest test of all, this latter can only be ascertained by those well versed in handling feathered stock. (*Farmer and Grazier.*)

A Use for Lemon Grass.

The *Journal d'Agriculture Tropicale*, No. 104, contains an account of a use for lemon grass that is under trial by the Government of Uganda. This consists in the cultivation of lemon grass, not merely as a source of essential oil, but as a prophylactic measure against sleeping sickness, which is especially prevalent among the natives who live on the shores of Lake Victoria-Nyanza. This plant, through the vapour of essential oil which it constantly produces, repels the greater number of insects, particularly the tse-tse fly (*Glossina morsitans*), by which the disease is transmitted.

From the account, it appears that the grass is cultivated as a border, about 300 yards broad, around the margin of the lake. Grown in this way, it improves the sanitary conditions, lessens the erosion of the soil, and yields, when cut, a profitable amount of oil. It is suggested that this use of the grass should be extended to other colonies in tropical Africa.

GLEANINGS.

L'Agriculture Pratique des Pays Chauds gives information which shows that the consumption of vanilla in Canada in 1908, was 15,518 lb.

The exports of rubber from the Para District in February 1910, were as follows: to the United States 3,018,284 kilos., Europe 2,481,916 kilos. (*Board of Trade Journal*, April 7, 1910.)

The date of the International Rubber and Allied Trade Exhibition to be held at Olympia, to which reference has already been made on page 60 of the current volume of the *Agricultural News*, is fixed for June 12 to 28, 1911.

The total amount of guano extracted from the Peruvian guano deposits in 1909 reached 73,578 tons. Of this quantity 50,378 tons were exported to Europe and the United States, and the remaining 23,200 tons were devoted to national agricultural purposes. (*Peru To-Day*, February 1910.)

The formation of societies for the insurance of live stock has attained a considerable development in France. According to the latest statistics, there are in existence 6,730 of these societies, representing a capital of £15,400,000, as against 1,469, possessing a capital of £2,300,000, in 1897.

According to the *Louisiana Planter and Sugar Manufacturer* for April 2, 1910, the imports of sugar into the United States, for the seven months ending January 31, were 750,569 short tons, of a total value of 36 million dollars, as compared with 880,112 short tons valued at 39 million dollars for the same period the year before.

The *International Sugar Journal* for April 1910, states that the total imports of sugar into the United Kingdom for the year ended March 1910, were 9,122,118 cwt., valued at £6,153,970, and the exports, 129,112 cwt., of a value of £98,817. The corresponding figures for 1909 were 8,431,925 cwt. and £4,701,718, and 135,224 cwt. and £95,025.

According to the London *Daily Telegraph* of the 5th ultimo, much inconvenience is being caused in England by the shortage of bananas. This is chiefly due to the bad weather that has been experienced recently in Jamaica and Central America, and the smaller shipments from the Canary Islands.

Mr. F. C. Bancroft, of Moonshine Plantation, St. George, Barbados, states that he has for sale four young half-bred West African ram sheep by 'Alaki', one of the rams imported by the Imperial Department of Agriculture. Two of the sheep are three months, and the others two months, old. The price wanted for each is £1.

The exports of cotton by sea from British India to foreign countries for the year 1907-8 was 8,562,024 cwt. of a value of Rs 257,025,196. The similar figures for 1903-4 were 7,931,075 cwt., valued at Rs 243,761,464. During the intervening years, the amounts were somewhat less than this. (*Quarterly Journal of the Department of Agriculture*, Bengal, January 1910.)

The total value of farm products raised in the United States in 1909 was about £1,752,000,000 as compared with £1,555,600,000 for 1908. The chief crops for 1909 were: corn, 2,772,376,000 bushels, of a value of £330,564,400; oats, 1,007,353,000 bushels (value £81,634,800) and wheat 737,189,000 bushels (value £146,009,200). (*Board of Trade Journal*, No 694.)

The honey and wax industry in Hawaii is valued at approximately $200,000. About $30,000 worth of honey was produced during 1907, and $6,000 worth of wax. It is estimated that the number of colonies of bees at present in the territory is about 20,000, and it is believed that this number may be doubled. (*Gleanings in Bee Culture*, April 1, 1910.)

It is stated in a recent number of the *Agricultural Journal of British East Africa* that the three decorticating machines chiefly used in German East Africa are the Mola, the Finnigan-Zabriski and the Neue Corona. Of these, the last-mentioned is the most generally used machine, as it can produce 2½ tons of clean fibre per day, while the Finnigan Zabriski and the Mola can only turn out ¾-ton and 2 tons, respectively.

An arrangement has been concluded between the Government of British Honduras and the Western Land Syndicate of Hull by which it is likely that this colony will become a larger producer of bananas than has been the case heretofore. The agreement is that the syndicate gives the Government the land on its estate which the latter requires for constructing the Stann Creek Railway, together with wood and ballast, and undertakes to cultivate yearly increasing areas, in return for concessions that have been granted to it. (*Colonial Office Journal*, April 1910.)

An account of an experiment which was performed in connexion with dry farming is given in the *Agricultural Journal of the Cape of Good Hope* for March 1910. It serves to uphold the great benefit that is derived by cultivation in dry land farming, and to show that the relative amount of evaporation which takes place in different parts of the colony is likely to determine as to whether dry land farming is possible in all parts having the same rainfall. Experience has already shown that it is quite likely that a 20-inch rainfall in some districts is no better than one of 15 inches, where the evaporation is relatively lower.

STUDENTS' CORNER.

MAY.

SECOND PERIOD.

Seasonal Notes.

At the end of the time during which the carême crop of cacao is being gathered, and before the trees begin to flower for the Christmas crop, the orchards should receive the sanitation which will have become a matter of yearly routine: that is to say, they should obtain the treatment for lessening the likelihood of the attack of the trees by disease, and by which such parts of the plants as show signs of fungus infection are removed and destroyed. This treatment will include the removal of dead branches, the excision of decayed wood from old wounds, and the subsequent dressing of all cut surfaces with Bordeaux mixture, followed a few days later by a covering of tar. What useful purposes are served by the Bourdeaux mixture and the tar? How are the wounds made in a cacao plant healed? The use of the knife will not be found necessary, in the case of the work just mentioned, only: a careful watch for canker will have to be maintained, and the diseased areas cut out and dressed in the way that has been described.

In the treatment of the soil under cacao, mulches and special manures should be applied before the commencement of the heavy rains. Why, in each case is this important? Remember that a 'mulch' in cacao cultivation does not derive its usefulness mainly from the fact that it assists in the conservation of the water in the soil, as is generally the case with such material. It is more than a mere mulch, in the significance of the term that is accepted usually. It has the function of keeping the soil in good condition, as well as that of providing a useful quantity of plant food. This is why it is often applied in amounts which are much greater than those which would be required for the first-mentioned purpose. (See Annual Reports on the Botanic Station, etc., Dominica; also the *West Indian Bulletin*, Vols. II, p. 96; V, p. 287; VI, pp. 258-62; VII, pp. 201-6; VIII, pp. 131-6; IX, pp. 138-43 and X, pp. 170-9.)

Careful attention should be paid, during the dry season, to cacao seedlings in nurseries, in order that the plants may be in a vigorous condition when they are planted out at the commencement of the rains. If a plant has had to struggle against adverse conditions when it was very young, the likelihood that it will grow to the best advantage when it is established is lessened. Special care should, therefore, always be taken in the raising of young plants of all kinds. One of the chief diseases to which young seedlings are subject is that known as 'damping-off'. What is the chief predisposing cause of this, and how would you proceed, where seedlings were affected by it, to attempt to preserve as many of them as possible?

The preparation of land on which it is intended to establish new cacao cultivation should be taken in hand. After manuring, in cases where this has been done, the fields should be lined, and holes prepared for the reception of the young plants. Give as many reasons as you can why cacao, as well as other crops, should be planted in such a way that the stand which is obtained may be as regular and orderly as possible.

At this time, the wind-breaks and shade for the trees should be put in, so that they will have reached a stage at which they may protect the cacao efficiently at the time when this work will be required of them. Note that cacao is not always grown under shade. What precautions must be observed in choosing the kind of tree that may be employed for the protection of a given cultivation? The matter of drainage requires careful attention, especially in the case of the heavier soils. Describe the kind of drainage that is generally employed on cacao lands in the West Indies. Why is drainage a more difficult affair in some places than in others? What usually happens, when land is not properly drained, (1) to the plants, (2) to the soil? How may the soil itself be treated so that the drainage from it is improved?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How can you tell if a soil requires to be drained?

(2) Describe the way in which cotton seed is tested, and prepared for planting.

(3) What is the number of sets that should be made from 1 lb. of yams?

INTERMEDIATE QUESTIONS.

(1) State the chief circumstances that would influence you in choosing an estate for cotton-planting.

(2) Give a description of the best fodder grasses that grow in the district in which you live.

(3) What are the chief objects sought in raising new seedling varieties of sugar-cane?

FREEING PASTURES FROM TICKS.

Farmers' Bulletin No. 378, of the United States Department of Agriculture, deals with methods of exterminating the Texas fever tick (*Margaropus annulatus*). It points out that, in taking measures for eradicating ticks, it is evident that the pest may be attacked in two places, namely, on the pasture and on the cattle. The method followed in freeing pastures may be either direct, in which all cattle, horses and mules are excluded from pastures until the ticks have died of starvation; or indirect, in which the animals are allowed to continue on the infested pasture, and are treated at regular intervals with oils or other agents destructive to ticks, so that the engorged females may be prevented from dropping and reinfesting the pasture. Two methods may be employed for the purpose of freeing animals of ticks: they may be treated with a substance that will destroy the ticks that are on them, or they may be pastured at proper intervals in fields which are free from ticks, until all those on them have dropped.

The time which it will take for the ticks in a pasture to die out, after the infested animals have been removed from it, varies considerably in different places, chiefly according to the conditions of climate and weather. Investigations conducted in Alabama show that it varies from five to ten months, in different parts of the year; farther south, the period is shorter. As a general rule, the time of infestation is lengthened by cold and moisture, and shortened by heat and dryness; other things being equal, high, unshaded land, which is dry, becomes free of ticks more quickly than land which is low, shaded and damp.

In the instance under consideration, seed ticks will take at least twenty days to appear, after engorged females have been dropped. The chief condition which regulates the time that is required for all the ticks to drop, after cattle has been placed on clean land, is the temperature. In Texas, it was found that the time varies from six weeks in the warmer months to ten weeks in those which are cooler.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

Part VI.

The UREDINALES (continued). In order to present a clear account of the different stages in the life-history of these fungi, a description of a particular species, *Puccinia graminis*, the black rust of wheat and other cereal crops, will be given. The spring condition of this fungus occurs on the leaves and other parts of the barberry (*Berberis vulgaris*), and on allied species; this is the stage already referred to as the cluster-cup, or aecidium stage. It consists of clusters of minute cup-shaped structures with white, fringed margins and golden yellow centres. The yellow colour is due to the formation of masses of spherical golden-brown spores, which are produced in chains from the ends of hyphae arranged in parallel layers at the bottom of the cups. With this stage are associated very minute spores known as *spermagonia*, which are abstricted from the tips of long, fine hyphae produced in flask-shaped cavities or *conceptacles* on the under side of the leaves. According to one theory, these spermagonia were originally male reproductive cells, but have now lost their function. This is, however, uncertain, and very little is really known about them, beyond the fact that they have practically lost their power of germination. The ripe aecidiospores are scattered by the wind, and if they fall on the surface of a leaf of wheat or other suitable grass plant, they germinate; the germ-tube enters the leaf through a stoma, grows rapidly and infects an area around the stoma. The mycelium then gives rise to *uredospores*, borne in a mass, which burst through the tissues of the host and form rusty brown streaks on the leaves. The uredospores are oval structures, unicellular, brown in colour, and covered with spines. They germinate almost immediately, when ripe, putting out several germ-tubes through pores arranged on the central line round the spore. These spores can infect other wheat plants, and their object is to increase the numbers of the fungus during any one season. As the season proceeds, the rust streaks become darker in colour, owing to the formation of the third spore-stage, the *teleutospores*. These are produced from the same mycelium as the uredospores, and are at first often mixed with them, though later the pustules contain teleutospores only. These spores are more or less oval in shape, dark brown in colour and bicellular, with a marked constriction at the median wall. They have thick walls, and are intended to carry the fungus through the winter. They either fall to the ground, or remain, on the withered leaves of the grass, in the pustules in which they were originally produced. In the spring, they germinate, each cell giving rise, through a single pore, to a four-celled basidium, as is shown in Fig. 26. Each cell of the basidium then produces a short sterigma, on the top of which the last spore-form, a *sporidium*, is borne. This spore is a hyaline, unicellular, frequently oval structure, much smaller than the other spore-forms; it is carried by the wind to the leaves of the barberry, where it germinates, enters the leaf, and produces a mycelium giving rise to the cluster-cups again, thus completing the life-cycle. The necessity for two different host plants on which to complete the life-cycle is known as *heteroecism*. This phenomenon was first definitely demonstrated by Schoöler in 1818, by infecting rye from the barberry, and was subsequently confirmed by de Bary and others. It was, however, suspected as early as 1781, when a law was passed in the State of Massachusetts, compelling the destruction of all barberry plants in the neighbourhood of fields of wheat and rye.

Fig. 26. Puccinia Graminis. Germinating Teleutospores.

To summarize, there are four spore-stages in the life-history of most of the Uredinales: the uredospore, the teleutospore, the sporidium, and the aecidiospore. Of these, the first two occur on one host plant, as for example, wheat; the sporidia are produced from the teleutospores lying on the ground or elsewhere, and can only infect a different host plant, as for example, barberry; from the mycelium so formed, arise the aecidiospores, which can only infect the first host. The phenomenon of heteroecism is general among these fungi, but is not always necessary, as some species can produce all their spore-forms on the same host.

The two remaining groups of the Basidiomycetes—the Hymenomycetes and the Gasteromycetes—possess one character in common besides the undivided basidia, for in both the basidia are closely packed together, side by side, to form a definite layer known as the *hymenium*. The difference between the two groups lies in the fact that, in the Hymenomycetes, the hymenium is exposed from the first, while in the Gasteromycetes it is enclosed until maturity.

Fig. 27. Root Disease of Sugar-cane. (*Marasmius sacchari.*)

The HYMENOMYCETES. This group may be divided into four subdivisions:—

Agaricaceae.
Polyporaceae.
Hydnaceae.
Thelephoraceae.

Fig. 28. Parasitic Wound Fungus. (*Polyporus* sp.)

In the Agaricaceae, the fructification is of the type usually known as a toadstool. On the under surface of the umbrella-like expansion are long radiating gills, over the surface of which is the hymenium. The fructifications may or may not be stalked, and the stalk may be central or lateral, but the gills are a constant feature. To this group belong *Marasmius sacchari*, the fungus causing root disease of sugar-cane (Fig. 27); *Marasmius semiustus*, causing disease of bananas; *Schizophyllum commune*, which sometimes attacks cane stems; and all the numerous saprophytic toadstools.

In the Polyporaceae, the hymenium lines the cavities of long or short densely packed tubes or shallow depressions occurring in a sporophore that frequently projects from trees, like a bracket. Several of the genera, especially *Polyporus* are wound parasites on different trees (Fig. 28). The sporophores may sometimes live for as long as fifty years.

In the Hydnaceae, the fructification again projects at right angles to the tree bearing it, and produces from its under side numerous acute spines, or warts, or folds, on which the hymenium is borne. Some members of the genus *Hydnum* are parasitic on trees.

In the Thelephoraceae, the hymenium is smooth and superficial, and the sporophore may have a central stalk, or may lie flat on the subtratum. To this group belongs the fungus causing pink disease of cacao (*Corticium lilaco-fuscum*). Most of its members are saprophytes.

The members of the Hymenomycetes, in general, contain comparatively few species recognized as parasites, the majority being saprophytes on decaying wood, or other vegetable remains.

The GASTEROMYCETES. This group contains very few parasitic forms, though numerous saprophytes of beautiful colouring and shape belong to it.

Two families may be shortly mentioned:—

Phalloidaceae.
Lycoperdaceae.

In the Phalloidaceae, the hymenium is borne on a receptacle that frequently takes the form of a fine net-work, or a wrinkled swollen terminal portion hung on a central stalk; the stalk and receptacle are at first enclosed in a definite skin, and the fructification is spherical. Later, however, the skin is broken by the elongation of the stalk, and the net-work, when present, hangs free at its summit. It is covered usually with drops of strongly smelling mucilage in which the spores are contained. The mucilage attracts flies, which assist in the dispersal of the spores. One species, *Phallus gracilis*, also known as *Ithyphallus coralloides*, and another *Clathrus trilobatus*, are responsible for root diseases of sugar-cane in Hawaii.

To the family Lycoperdaceae belong the puff balls, which are closed, more or less spherical, white or yellowish fructifications, dehiscing by a terminal pore when ripe, and setting free a mass of dusty spores. In some cases, there is a long central stalk, as in the Phallaceae, surmounted by a cap bearing the spores, the whole being enclosed within a definite skin until these are ripe.

In the *Agricultural News*, Vol. VII, p. 227, there appeared a paper by Mr. W. P. Ebbels, of Mapore, Mauritius, on the use of molasses in increasing the fertility of sugar-cane lands. An abstract in the *Experiment Station Record*, Vol. XXI, No. 2, of the United States Department of Agriculture, shows that further work has confirmed the results obtained at first. Experiments in connexion with this matter are being conducted in Antigua. (See Pamphlet No. 64.)

LEAD CHROMATE AS AN INSECTICIDE.

The Agricultural Research Institute, Pusa, has recently published a pamphlet in which the use of lead chromate in the place of arsenical insecticides, is advocated. The contents of this are as follows:—

There are grave disadvantages in India in the use of arsenical poisons as insecticides, and for many reasons we have endeavoured to find a reliable substitute. Formerly, Paris green was used in India, as elsewhere, as a standard application; in 1903, lead arseniate was introduced and arrangements made for its manufacture and sale. We have now abandoned lead arseniate in favour of a non-arsenical preparation, one of many hundreds that have been tested at Pusa during the last four years. This is lead chromate, a compound that is poisonous to human beings and cattle, but which has not the very grave disadvantages attaching to arsenic. It is cheaper than lead arseniate, and arrangements have been made for its sale at annas 13 (1*s.* 1*d.*) per lb. in paste or powder, the paste being sold on its lead chromate content, and not on its bulk weight. For ordinary uses, lead chromate is most easily made by dissolving separately, 2 parts by weight of a lead salt, e.g., lead acetate or nitrate, and 1 of potassium bichromate; the solutions are mixed and 2 parts of lead chromate precipitated. In this way, the substance is made in its best form for spraying. The simplest procedure is to dissolve the lead salt in the spraying machine, and to dissolve the bichromate separately in a tin of water, and then to pour it into the spraying machine.

Lead chromate is a heavy, yellow substance, easily visible upon the plant, which does not burn the foliage, adheres extremely well in spite of wind and rain, and does not decompose into compounds that burn the plant. It has been used on a great variety of crops in the Pusa farm; leaves sprayed heavily with it have retained it for six weeks in spite of heavy rain, and the leaf has remained healthy. Plants can be sprayed with it until they are yellow, and no harm is done. The substance is not as poisonous as lead arseniate or Paris green, but is a first-rate deterrent to plant-feeding insects; sprayed plants will not be eaten by insects.

We recommend a strength of 1 lb. in 64 gallons of water, as an insecticide on crops that are being attacked, or 1 lb. in 100 gallons of water as a deterrent upon crops which it is essential to protect from attack.

Applied at these rates, no harm results to fodder crops, which can be safely fed to cattle, and unless the spraying is done very badly and all the lead chromate applied at one spot, no poisoning effect would follow upon any crop or plant if eaten afterwards.

For the Knapsack spraying machine, 1 oz. of lead acetate may be dissolved in the machine, ½-oz. of potassium bichromate, powdered, dissolved and added; or 1½ oz. of paste, or 1 oz. of dry chromate may be thoroughly rubbed up in the machine.

Careful trials would be required before it could be determined if lead chromate is more suited to West Indian conditions, as an insecticide, than Paris green.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, April 26, 1910; Messrs. E. A. DE PASS & Co., April 15, 1910.

ARROWROOT—St. Vincent, $1\frac{3}{32}d.$ to 3d.
BALATA—Sheet, 4/9; block, 4/- per lb.
BEES-WAX—£7 17s. 6d. to £8 2s. 6d.
CACAO—Trinidad, 53/6 to 63/- per cwt.; Grenada, 50/- to 54/6 per cwt.; Jamaica, 47/6 to 53/6.
COFFEE—Jamaica, 40/- to 55/-.
COPRA—West Indian, £28 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; St. Croix West Indian, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
HONEY—26/- to 32/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 10d. to 1/1; concentrated, £18 15s. to £18 17s. 6d.; Otto of limes, 5/9 to 6/-.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Steady.
PIMENTO—Common, 2⅛d.; fair, $2\frac{3}{16}d.$; good, 2¼d. per lb.
RUBBER—Para, fine hard, 12/2, fine soft, 12/-; fine Peru, 12/- per lb.
RUM—Jamaica, 2/1 to 5/-.
SUGAR—Crystals, 18/9 to 20/3; Muscovado, 14/- to 15/6; Syrup, 13/3 to 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., April 15, 1910.

CACAO—Caracas, 11¼c. to 12c.; Grenada, 11¼c. to 11½c.; Trinidad, 11c.⅝ to 11⅞c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $28·00 to $29·00; culls, $16·00; Trinidad, select, $27·00 to $28·00; culls, $15·00 to $16·00 per M.
COFFEE—Jamaica, ordinary, 9c. to 9½c.; good ordinary, 9½c. to 10c.; and washed, up to 11½c. per lb.
GINGER—9½c. to 13c. per lb.
GOAT SKINS—Jamaica, 52c.; Barbados, 47c. to 50c.; St. Thomas, St. Croix, St. Kitts, 43c. to 45c. per lb.; Antigua, 47c. to 50c., dry flint.
GRAPE FRUIT—$2·00 to $2·75 per box.
LIMES—$8·00 to $9·00.
MACE—32c. to 36c. per lb.
NUTMEGS—110's, 9c. to 9¼c. per lb.
ORANGES—Jamaica, $1·50 to $2·00.
PIMENTO—4⅝c. per lb.
SUGAR—Centrifugals, 96°, 4·30c. per lb.; Muscovados, 89°, 3·80c.; Molasses, 89°, 3·55c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., April 30, 1910.

CACAO—Venezuelan, $11·75 per fanega; Trinidad, $11·25 to $11·75.
COCOA-NUT OIL—96c. per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·60 per 100 lb.
DHAL—$4·35 to $4·40 per 2-bushel bag.
ONIONS—$3·50 to $3·75 per 100 lb.
PEAS, SPLIT—$6·50 to $6·60 per bag.
POTATOS—English, $1·75 to $2·00 per 100 lb.
RICE—Yellow, $4·40 to $4·50; White, $4·70 to $4·80 per bag.
SUGAR—American crushed, $5·10 to $5·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., May 9, 1910; Messrs. T. S. GARRAWAY & Co., May 9, 1910; Messrs. JAMES A. LYNCH & Co., May 2, 1910.

ARROWROOT—St. Vincent, $3·40 to $3·75 per 100 lb.
CACAO—$11·50 to $13·00 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
HAY—$1·20 to $1·60 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—Bunched, $1·50 to $3·00 per 100 lb.
PEAS, SPLIT—$6·10 to $6·75 per bag of 210 lb.; Canada, $3·00 to $3·60 per bag of 120 lb.
POTATOS—Nova Scotia, $1·50 to $2·75 per 160 lb.
RICE—Ballam, $4·33 to $4·80 (180 lb.); Patna, $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, April 30, 1910; Messrs. SANDBACH, PARKER & Co., April 29, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·00 to $8·25 per 200 lb.	$8·00 to $8·25 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	48c. per lb.	None
CACAO—Native	11c. to 12c. per lb.	10c. to 11c. per lb.
CASSAVA—	$1·20	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	12c. to 13c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	14c. to 14½c. per lb.	14½c. to 15c. per lb.
Liberian	10c. per lb.	10c. per lb.
DHAL—	$4·25 per bag of 168 lb.	$4·25 per bag of 168 lb.
Green Dhal	$5·75	——
EDDOS—	72c. to 96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	3¼c. to 3½c.	3¼c.
Madeira	——	No quotation
PEAS—Split	$6·40 per bag (210 lb.)	$6·40 per bag (210 lb.)
Marseilles	$3·50	$3·50 to $4·25
PLANTAINS	12c. to 40c. per bunch	——
POTATOS—Nova Scotia	$1·75 to $2·00	$1·75 to $2·00
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	$1·68 per bag	——
RICE—Ballam	No quotation	$4·75
Creole	$4·00 to $4·20	$4·00 to $4·20
TANNIAS—	68c. per bag	——
YAMS—White	$2·40	——
Buck	$2·40 per bag	——
SUGAR—Dark crystals	$3·05 to $3·10	None
Yellow	$3·60 to $3·70	$3·70
White	$4·00	$3·80 to $4·00
Molasses	$2·25 to $2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

DEPARTMENT OF SCIENCE AND AGRICULTURE, BRITISH GUIANA.

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Candidates must submit with their applications, details of their training in Agricultural Science and in practical Agriculture accompanied, if feasible, by diplomas from the institution where trained, or of certificates in Agriculture issued by the Imperial Department of Agriculture for the West Indies, or the Department of Agriculture of any other tropical country, copies of satisfactory certificates of health and of character, together with copies of not more than three testimonials from their present and former employers.

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3. The selected candidate will be required to sign a form of agreement previous to appointment.

4. Applications should be addressed to the Director of Science and Agriculture on or before May 31, 1910.

J. B. HARRISON,
Director of Science and Agriculture.

March 23, 1910.

JUST ISSUED.

WEST INDIAN BULLETIN.

(Vol. X, No. 3.)

Containing papers on Legislation in the West Indies for Controlling Diseases on Imported Plants; Fungi Causing Diseases of Cultivated Plants in the West Indies; Manurial Experiments with Cotton in the Leeward Islands; Rainfall of Nevis and Antigua; Courses of Reading and Examinations in Practical Agriculture.

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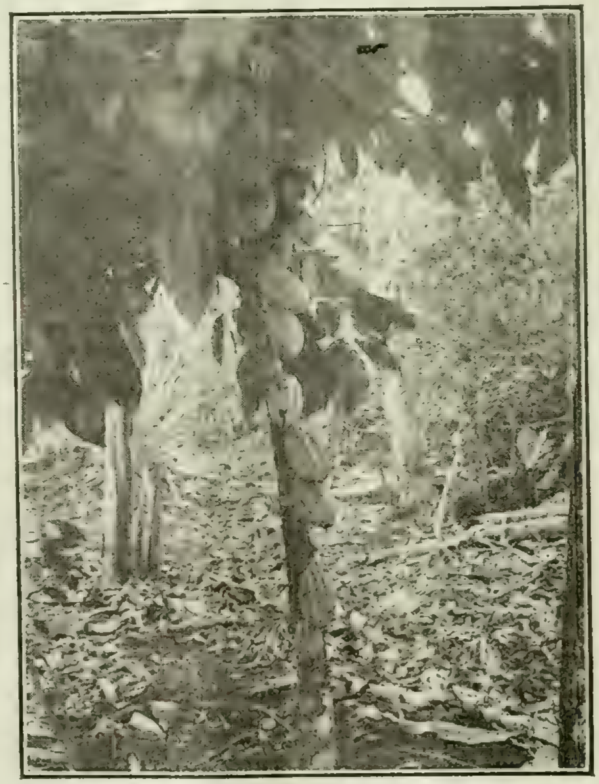

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Fungi in Relation to Agriculture.

MUCH misapprension has existed for many years, in the world of agriculture, with regard to the true significance of the term Fungus. In the early days, when the results of abstract biological science were first employed in connexion with practical agriculture from an economic standpoint, there was often uncertainty, on the part of those in receipt of advice, as to the place of fungi among living beings. Thus the term came to have a somewhat loose significance, as is naturally the case when a word is employed commonly in one more or less specialized relation. It is easy to understand, for example, the difficulty of realizing that the fungus causing root disease of sugar-cane, is actually a relative of the grey fungus so commonly found on the parts of dead trees.

The fungi form a subdivision of the plant kingdom. The group consists of several thousand species of plants, which differ enormously in size, structure and complexity. They are grouped together for several reasons, as for example, the similarity of their vegetative parts, the fact that they are all reproduced by means of spores, and that all of them, without exception, have entirely lost the power of forming chlorophyll—the green colouring matter which occurs in all other plants, with but few exceptions, and without which the plant is unable to elaborate its own food-supply from the carbon dioxide and oxygen contained in the air. For this reason, the fungi may be looked upon as a degenerate group of plants, that is, when regarded from the standpoint of the main path of evolution; in their own line, however, they have attained very considerable complexity in their reproductive arrangements, and also show many and varied forms of adaptation to the manner of life which they have been driven by different circumstances to adopt. Members of this large assemblage of plants may be found living under the most various circumstances of temperature and moisture, and with widely different sources of food-supply.

It will now be apparent that a term which is applicable to so many and so various forms of plant life can hardly be expected to possess in reality the narrow significance indicated in the opening paragraph.

The subject may be further considered at somewhat greater length from a different point of view. Since the fungi are unable to obtain their own food-supply from the air, it follows that they must obtain it already manufactured from one or more sources. The only organism that can manufacture its own food-supply from the air is the green plant, so that, clearly, one possible source of food for the fungi is the bodies of such plants, either alive or dead; moreover, since animals may be regarded as fundamentally dependent on green plants for their food-supply, their dead or living bodies also offer a possible source of food to the fungi. These are the only available food-supplies for these plants.

As would be naturally expected, all four sources of food, namely living and dead plants, and living and dead animals, are utilized by different species of fungi. Those fungi which live on dead plants or animals, or on the products of the decay of such, are known as saprophytes; while those that obtain their food from living sources are known as parasites. There is an intermediate class, the facultative parasites, which can attack some living plants, or can if necessary, live on dead vegetable matter.

Although these are the more technical divisions of the fungi, they may be considered differently in their relation to agriculture. In this connexion, there are three points of importance. Firstly, there is the damage that they cause; secondly, the advantages that some of them confer; and lastly, the development of which these advantages are capable.

Some of the forms that grow on animal and vegetable products—saprophytes—are a source of annoyance and loss to man, as for example the moulds that grow on grain, bread, cheese, and other eatables, or even on cloth and leather. These may, however, be kept in check without much difficulty. Among the facultative parasites, many species can attack the roots of various economic plants, and even if they do not actually bring about the death of their hosts, they weaken them to such an extent that the value of the crop produced is greatly diminished; moreover, their power of living on decaying remains of these hosts, or even on those of other plants, renders them extremely difficult to eradicate, once they have obtained a hold. Among the class known as parasites are included all those forms understood by the term Fungus in its more narrow application. They are undoubtedly a source of great loss to all those interested in agriculture, and even when the greater part of the loss can be obviated by the employment of sound preventive measures, the carrying out of such measures involves the expenditure of considerable sums of money.

On the other hand, many species are of considerable service to man, for several of them help to destroy old plant and animal remains, and in this way act as scavengers. They may, for example, live on heaps of dead leaves, old tree stumps, decaying branches, or any other accumulations of rubbish. They often possess the power of secreting enzymes, which can dissolve various forms of organic matter not otherwise easily destructible. The products of their action go to increase the humus content of the soil, often in forms in which they are available to higher plants as a source of food. Such fungi must be regarded as useful, both in their capacity of scavengers, and in their function of suppliers of humus products to various crops. Other species can live on harmful fungi, and are useful in this way, while still others are parasitic on various insects of economic importance and are, even under natural conditions, of great importance as a supplementary means of keeping such insects under control.

The recognition of this last point is of comparatively recent date, and the observations and experiments that have been carried out so far tend to show that it is of primary importance in the control of certain insect pests in tropical and sub-tropical climates. The parasitic fungi may be readily encouraged by various means, and under such circumstances afford a way of controlling such pests, which is very much cheaper, and at the same time more effective, in many cases, than any of the artificial methods in common use at the present time. The employment of parasitic fungi in the control of various pests is at present, comparatively speaking, in its infancy, but there can be little doubt that, should this method fulfil in the future the promise held out by the results of experiments conducted up to the present time, it will prove of the utmost service to the practical agriculturist.

THE INFLUENCE OF THE STRUCTURE OF SUGAR-CANE ON MILL WORK.

The first two parts of Bulletin No. 30 of the Hawaiian Sugar Planters' Association, which presents the results and conclusions gained from experiments designed to ascertain the influence of the structure of the sugar-cane on control work, as well as on the extraction of sugar, received consideration in the last number of the *Agricultural News*. The third part of the bulletin has relation to the extent to which the work of mills is affected by the structure of the cane. Attention is first drawn to the ordinary observation that increased pressure in the mill results in the production of

inferior juice. For the purpose of the investigation of the effect of such increased pressure, the cane is regarded as being divided into rind, nodes and interior pith, not because of any botanical significance, but for the purpose of introducing simplicity into the consideration of the subject.

After a brief review of previous work on the structure of the sugar-cane has been given, the author proceeds to outline the method of division of the cane which he employed in practice. The procedure was to saw through the node, on each side of its widest part, on the outer line of the region from which the adventitious roots spring, and to strip the internode, thus separated, of the rind. The rind was not separated from the node, so that this portion consisted chiefly of rind, fibro-vascular bundles and a certain amount of pith. The different parts obtained in this way were then analysed in order to find their content of moisture, fibre, solids and sucrose, the fibre being determined by difference. Using the varieties Rose Bamboo, Yellow Caledonia and Lahaina, the figures for the last two being obtained from cane grown in two different places, the following are the means of the highest and lowest results obtained:—

	Whole cane.	Pith.	Rind.	Node.
Weight, per 100 cane	100·0	68·0	12·7	19·6
Juice, per cent.	86·4	92·5	67·4	79·4
Fibre ,,	13·6	7·6	32·6	20·6
Solids ,,	17·4	19·1	12·4	14·8
Sucrose ,,	15·6	18·0	8·8	11·9
Water ,,	69·3	73·8	54·3	64·3

The actual figures from which the above means are calculated were then employed to find others, which are given in a table. The statistics contained in this are again used here in giving the means of the highest and lowest results, as follows:—

	Absolute juice.	Pith juice.	Rind juice.	Node juice.
Weight, per 100 cane	86·4	63·4	8·2	15·8
Solids, per cent.	19·8	20·4	18·5	18·2
Sucrose ,,	17·9	19·2	13·1	14·7
Purity	86·6	90·8	68·5	77·9

As was explained in the article dealing with this bulletin in the last number of the *Agricultural News*, the term 'absolute juice' means everything that is not left behind on extraction with water.

A further use was made of the results obtained, in the direction of calculating the amount of sucrose contained in each portion per 100 sucrose of cane. Taking the means of the outside results, as before, the sucrose, per cent. on sucrose in cane, is found to be: pith, 77·6; rind, 7·5; node, 14·8.

Having regard to the purity of the juice in these different parts of the cane, it was possible to find the distribution of the available sugar in the cane, so that, taking again the means of the extreme results, the available sugar, per cent. on available sugar in cane, is: pith, 81·1; rind, 5·8; node 13·2.

It is pointed out that the results show that the part which has been considered as node has a composition which is intermediate between those of the pith and the rind, so that the cane may be regarded as being made up of a soft, interior portion composed of a small amount of fibre and a juice of high purity, and of a hard, outer portion containing much fibre and a juice of low purity. If, then, the part which has been called 'node' is divided equally between the pith and the rind, the average composition of the canes employed in the experiment must be as follows:—

	Weight, per 100 cane.	Fibre, per cent.	Solids, per cent.	Sucrose, per cent.	Purity.
Whole cane	100·0	13·7	17·1	14·8	...
,, ,, juice	86·3	...	19·8	17·1	86·4
Soft part	77·0	8·0	18·5	16·7	...
,, ,, juice	70·8	...	20·2	18·5	90·3
Hard part	23·0	33·0	12·3	8·5	...
,, ,, juice	15·5	...	18·3	12·7	69·1

Following on this, an attempt was made to trace the changes that took place in these soft and hard parts during their passage through the mill. In practice, it was naturally only possible to effect a rough separation into two parts, one consisting mostly of pith and one made up chiefly of rind, and the method did not eliminate the error that must perforce accrue through the retention of juice from the soft portion by the rind. Taking, as before, the means of the extremes, but with three canes grown in four places, in this instance, the following table may be constructed:—

	Expressed juice.	Pith megass.	Rind megass.
Weight, per 100 cane	67·8	14·6	18·2
Solids, per cent	21·0	13·4	11·3
Sugar, ,, ,,	19·2	11·2	8·0
Water, ,, ,,	...	52·7	50·3
Fibre, ,, ,,	...	34·9	37·5
Purity	88·9	...	...

The next step was to find the extraction that took place, from the harder and softer parts of the cane, in its passage through a train of mills. In this process, the megass had to be separated by hand into the two representative portions, so that the division was somewhat imperfect. The following table shows the results of the analysis that are given, to one place of decimals:—

Rollers in Train	12	12	12	15	12	15
No. of Mill	I.	II.	III.	III.	IV.	V.
Pith megass—						
Weight, per 100 megass	53·3	48·6	50·0	48·5	51·3	50·0
Sucrose, per cent.	11·3	7·2	3·8	3·9	2·9	2·7
Fibre, ,,	33·6	41·6	45·6	46·8	46·9	49·4
Rind megass—						
Weight, per 100 megass	46·7	51·4	50·0	51·5	48·8	50 0
Sucrose, per cent.	9·1	7·1	4·3	4·7	4·1	3·6
Fibre, ,,	35·2	41·5	44 9	45·9	46·7	48·6
Whole megass—						
Weight, per 100 megass	100·0	100·0	100·0	100·0	100·0	100·0
Sucrose, per cent.	10·3	7·2	4·1	4·3	3·5	3·1
Fibre, ,,	34·3	41·6	45·3	46·0	46 9	49·0

The following methods are suggested for obtaining an increased amount of sugar from the rind:—

(1) Higher pressures, resulting in the greater rupture of the rind tissue, and giving at once a higher expression and a material more suited for the absorption of water.

(2) The obtaining of more effective disintegration of the rind tissue by the use of knives, shredders, crushers, or heavily indented rollers.

(3) The application of the maceration water by means of injectors, as has been suggested recently by Pellet, instead of by a perforated pipe; or by the use of macerating baths through which the megass is drawn.

Finally, evidence is adduced to show that the best results will be obtained by the employment of higher pressures, and attention is drawn to the fact that the milling qualities of a cane do not depend merely on its content of fibre, but on the distribution of this throughout the cane.

WEST INDIAN FRUIT.

LEMON CULTIVATION IN ITALY.

The following information concerning the way in which lemon trees are cultivated in Italy is taken from Bulletin No. 160 of the Bureau of Plant Industry, United States Department of Agriculture, entitled *Italian Lemons and Their By-products.*

PROPAGATION. There are no extensive nurseries in Italy where lemon trees are grown as they are in the United States. The stocks of bitter orange are usually grown by the owners in small seed beds under the bearing lemon trees. The bitter orange grows wild in Sicily and in the mountains of Calabria, and is now used universally as a stock on account of its resistance to the gum disease, which devastated the groves of Sicily about thirty years ago, when the trees were propagated on lemon stocks.

The orange seeds are sown in the spring, in a well prepared bed, and the seedlings are usually transplanted, when a year old, at a distance apart of 10 inches or a foot, in small clumps under the bearing trees, or in distinct areas. When the trees reach a diameter of 1 to 2 inches and a height of 5 to 6 feet, they are transplanted to the garden or grove. They may or may not have been budded or grafted with the desired type of lemon before transplanting. The lemon bud is usually inserted from 2 to 3 feet from the ground, and the top of the lemon tree is started from 6 to 4 feet from it. As the trees grow older the lower, shaded branches die and, as with the apple trees of the Eastern States, the main branches lose the lower, bearing wood and the trees become increasingly high-headed and spreading. In many of the old groves in Sicily, the lowest fruit-bearing branches are from 6 to 10 feet from the ground. Many of the closely planted lemon trees are irregular in form in both trunk and top, the trunks of many of the trees assuming a crooked, almost tortuous, outline.

While the lemon trees are young, it is a common practice to grow cereals or vegetables between the rows. This crop may be grown by the owner or by the tenant, or the land may be sublet to a second or third party for this purpose.

PRUNING. The lemon trees of Italy are not pruned systematically as they are in California. Pruning in Sicily means the cutting out of dead wood and the shortening of the vigorous suckers every year or two, and the opening of the top when the trees become dense. The object of pruning is similar to the general practice of pruning orange trees in California, though it is much more roughly done; an axe is often used in cutting out the wood. No system of pruning has been developed, the purpose of which is to keep the trees low-headed, to modify the density of the tree, to stimulate the production of new bearing wood, or to modify the growth of the bearing wood in different parts of the tree. The growers generally believe that the low, dense-headed tree produces a tender lemon, of poor keeping qualities, and that scale insects and diseases are much less serious in the trees with the high, open, spreading form, which admits the air and sunlight to the greatest extent.

TILLAGE. The tillage of the Italian lemon groves is practically all done by hand labour; occasionally it may be done in the larger groves with oxen and a primitive one-handled plough, though ploughing in the lemon groves in Italy is a rare operation. The land is generally turned over from 5 to 10 inches deep with a short, heavy hoe, twice a year, in February or March, and again in September, and twice lightly, 3 inches or more deep, in May or June and in November, to turn under the weeds. The relation of tillage to the conservation of moisture and to the liberation of plant food is not understood.

MANURING. The principal manure used in the lemon groves is composted sheep, goat, or cow manure. Chemical manures have come into use to a limited extent in recent years. Sulphate of ammonia is the principal source of nitrogen, with nitrate of soda used to a less extent; sulphate of potash and ashes are used chiefly for potash; and bone meal, slag and ground rock are among the sources of phosphoric acid. Artificial manures have been experimented with, in recent years, in connexion with cover crops and with organic manures. Several factories have been organized in Sicily for the manufacture of artificial manures.

There is no definite system of manuring used by the Italian lemon growers. There seems to be the same lack of exact knowledge among the growers as to the manurial requirements of the trees as there is among the lemon growers of the United States. There is no agreement as to the kind of manure or the quantity to use, or the time or method of application. The manure that is advocated most plausibly is likely to be employed most generally, and different growers using different kinds are likely to get equally good results, if the land is kept in good physical condition. All are agreed that the trees need to be fed liberally, though they are not fertilized as regularly, or to the extent practised by the growers of California.

There is a general agreement among the growers that

the physical qualities of the soil must be maintained by the frequent use of manure, or by turning under a cover crop of weeds. As in California, some of the growers have an impression that stable manure makes the fruit coarse in texture and of poorer keeping quality. The manure is applied generally in the spring, but sometimes in the autumn. It is dug into the irrigating basin around the tree or into the bottom of the irrigating furrows. In some groves, the manure is applied in the basin round the tree every other year, and in the years between, further away from the tree in the bottom of deep furrows, in order to reach the fine, distant, feeding roots. It is not practicable to discuss the manuring question further, as there is an endless variation in the methods of application, and in the quantities of natural and artificial manure in use. The variation in the quantity of manure per tree will run from 40 lb. to 150 lb., and in chemical manure from 2 lb. to 10 lb., depending on the nature of the manure, the condition of the trees, and the general practice of the grower.

THE TONKIN RUBBER TREE.

Information regarding the Tonkin rubber tree, or teonon (*Bleekrodea tonkinensis*), was given in the *Agricultural News*, Vol. VIII, p. 377. The additional particulars which are presented below regarding this plant are taken from *l'Agriculture Pratique des Pays Chauds* for January and February, 1910:—

The flowering of this plant takes place at two periods of the year—March to April and August to September; but these dates vary to a small extent with the latitude. The fruits appear as small berries, which are green at first, and become yellow-orange when ripe. At this stage, the fruit opens in order to free the seed. The plant is reproduced easily by means of these seeds, but it must be mentioned that the fruits are much sought after by birds, so that the dissemination of the plant by natural means is diminished to a great extent. A certain number of seeds are, however, saved by the fact that the fruits, while still on the branches, open and drop the seed. An additional method of reproduction is by means of numerous root buds. It is easily reproduced by cuttings containing these.

Up to the time of the discovery of this plant, the genus *Bleekrodea* included two species: *B. insignis*, a native of Borneo, and *B. madagascariensis*, a native of Madagascar. Owing to various circumstances, and in consideration of the close relationship of teonon to these, it was not thought worth while to create a new genus.

It was purely by chance that the natives gained an idea of the value of the latex of *B. tonkinensis*; their recognition of this arose from a demand by several firms in Tonkin for rubber. This caused the latex to be collected in ways which would produce as much of it as possible with the least trouble. One of the methods is to make cuts in the lower part of the trunk and in the bigger branches, to a height of about 10 feet. A large number of these is made, on account of the idea that the greater the number of the cuts, the greater will be the yield of latex. As a matter of fact, the quantity is lessened by this treatment, because the latex-bearing vessels are divided to such an extent as to interfere with its natural flow. Another method, which is also employed for rubber-yielding lianes, is to strip off large portions of the bark. Finally, a means which is rougher than either of these is to cut the plant into pieces, and to extract the rubber by holding one end of the portion so obtained over a slow fire; this causes the latex to become mixed with the ordinary juice of the plant.

In whatever way it may be obtained, the latex is collected in small vessels, each made of an internode of the bamboo, cut to a point at one end in order that the liquid may flow into them more easily. The pieces of bamboo, with their contents, are carried to the village, where they are boiled in water. In this way, pudding-shaped pieces of rubber are obtained, which, owing to the method by which they are prepared, contain all the impurities at the middle.

The latex is usually collected before the beginning, and after the end, of the rainy season. The natives are inclined to limit their labours to the second period, because they consider that the yield is greater at this time. There may be some reason for this opinion, on account of the fact that, at the end of the rainy season circulation takes place more rapidly in the plant by reason of its greater water content. At any rate, it is certain that the plant is extremely sensitive to seasonal changes, and gives yields which vary greatly according to the latitude in which it grows. It is certain, too, that the circumstances of temperature have a well-marked action on the flow of latex from this tree. Trials appear to have shown that the most abundant flow is obtained when the shade temperature is between 24° and 28° C.

The composition of the raw rubber is as follows:—

	Per cent.
Water	28·32
Ash	0·62
Rubber	60·76
Resin	3·67
Foreign matters (by difference)	6·63

In this analysis, the amount of true rubber appears small, but this is due to the large proportion of water in the specimen examined, on account of the fact that this had only been made three days before the analysis was undertaken.

USES OF WEEDS.

An article in the *Tropical Agriculturist* for February, 1910, contains a summary of the uses to which weeds may be put. These are presented as follows:—

Plants which are weeds under certain circumstances, may under other circumstances have the following recognized uses:—

(1) The use as nitrogen plants grown for the purpose of enriching the soil in this most important element.

(2) As cover plants grown to shade the soil and to enrich it with added humus, but not necessarily with nitrogen.

(3) Plants grown on steep slopes in order to check wash.

(4) Shade plants and wind-breaks.

(5) Sand-binding plants, which prevent the spread of shifting sands.

(6) Climbing plants grown for the purpose of smothering particular weeds.

It must not be forgotten that weeds are also indirectly of use to the agriculturist in that they often serve to give an indication of the type and quality of the soil on which they grow, and what is more important, their tendency to appear after a crop has been planted often ensures that adequate tillage will be practised for the latter, on account of the disturbance of the soil that is entailed in removing them.

Weeds are interesting, too, from an historical point of view, for all plants that are now cultivated are derived from wild forms that would, in an ordinary way, be regarded as weeds. Closely connected with this is the fact that many of them yield useful drugs, and some are even used as food.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 9, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 400 bales of West Indian Sea Islands have been sold at firm prices.

The sales include about 60 Anguilla, 20½*d.* to 21*d.*; 20 St. Martin, 20½*d.* to 21*d.*; 60 Nevis, 19½*d.* to 21*d.*; 50 Montserrat, 18*d.* to 20*d.*; 80 St. Kitts, 20*d.* to 22½*d.*; 20 Antigua, 20*d.* to 21*d.*; 60 Barbuda, 20*d.*; 25 Virgin Isles, 21*d.*; 20 Barbados, 20*d.* to 21*d.*; and about 50 Stains from various Islands at 13*d.* to 16*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 30, is as follows:—

The market is very quiet, with apparently no demand. The unsold stock is very small, and consists principally of Planters' crop lots held at 38c., 40c., and 50c.

BACTERIAL DISEASE OF COTTON.

During the cotton season of 1909, the attention of the Mycologist was called to the apparent prevalence of the disease of cotton bolls throughout practically all the islands of the Windward and Leeward groups. Notice was first taken of it in Montserrat, and specimens were forwarded to the Head Office and examined in October of last year. The disease appears to be fairly common in Barbados and, according to the observations of the Imperial Commissioner, is of frequent occurrence in Antigua and the majority of the Leeward Islands. While never assuming the proportions of an epidemic, it would seem to cause a constant loss every year, which may vary according to the season, from 2 per cent. to possibly as much as 20 per cent. of the cotton crop. These figures are, however, very uncertain, as no experiments have yet been conducted to discover definitely the extent of the damage done.

The disease appears to be the same as that described by W. A. Orton, in *Farmers' Bulletin*, No. 302, of the United States Department of Agriculture, as 'bacterial blight', and attributed by him to *Bacterium malvacearum.* This organism appears to be capable of infecting the leaves, young stems and bolls of cotton. On the leaves, it causes angular leaf spot—a disease which is of common occurrence on the older leaves of cotton in the West Indies. On the stem, it takes the form of black arm; in this, brown, sunken areas of dead tissue are formed, which eventually nearly circle the young stems and cause the latter to break off. This form of the disease is not common in the West Indies. Finally, it causes dark-brown or nearly black, hard, sunken areas on the the bolls, which are often cracked in the centre and are surrounded by a somewhat indefinite line of tissue of a darker green colour than that of the rest of the boll.

Examination of the Montserrat specimens disclosed two types of disease, one of which was probably identical with that found on cotton bolls in the States and attributed to *Bacterium malvacearum*; the other showed several points of difference, but it is possibly also to be attributed to the same organism. In the first form, very small, diseased areas appear on the side near the tip of the bolls; these are brown in the centre, and are surrounded by a ring of darker green than the rest of the boll. In this early stage, sections show that the dark centre consists of cells full of gummy substances, forming a pocket, filled with bacteria, between themselves and the dying epidermis. The sections further suggested that the bacterium, which is motile in some stages, probably enters through the stomata when the boll is damp. These areas extend rapidly, and eventually become hard, dry and cracked, being bounded by a darker green and somewhat indefinite line. When the tip of the boll is attacked, the disease may extend downwards for a distance of nearly one-third of the length of the boll all round. At this stage, it resembles anthracnose, but there is no red line characteristic of the latter disease. The lint under the spots is often green, and even when not discoloured, is wrinkled, abnormally glossy, and very weak. The characters of this lint, though difficult to describe, are easy to identify, with very little practice. In addition to damaging the lint, the disease is a source of loss in two ways: young bolls so attacked fall, and on older bolls lesions are formed which prevent them from opening properly. It may also be mentioned that bolls suffering from this disease show round, discoloured patches resembling those of angular leaf spot on the bracts and calices.

The second form of the disease commences at the junction of the boll with the stock and spreads upwards and downwards, stopping the growth at one side of the boll and causing it to bend over a little on that side. The disease penetrates to the lint and turns it into a colourless mucilage on the side attacked, while that on the other appears healthy. The seeds become abortive on the side attacked, and, later, show the presence of the the bacteria. The spread of the disease up the boll from the base is accompanied by a softness of the outer boll tissue and a somewhat purple discolouration. Such bolls generally fall; they also show the discoloured patches on the bracts and calices mentioned in connexion with the first form of the disease.

The probable connexion of this disease with angular leaf spot is important, as practically no field of cotton is free from the latter, and it is reasonable to assume that infection is mainly spread by broken pieces of diseased leaves that contained the bacteria and are carried by the wind to healthy parts of other plants. In this case, the best remedy probably lies in destroying all old cotton as early as is feasible, so as to give the longest possible interval between two successive plantings of cotton on the same land.

Fungal hyphae have occasionally been found in these areas in both forms of the disease; but as they are not always present, it is reasonable to assume that they are only of a saprophytic nature and that the bacteria are the real cause. This is further supported by the fact that there were indications that the mycelium belonged to a species of *Fusarium*, several of which are known to be saprophytic on diseased portions of the cotton plant.

In the supplement to the Nyasaland *Government Gazette* for February 28, 1910, an account is given by J. S. J. McCall of the effects of this disease in that Protectorate, where the Egyptian variety of cotton has been so severely damaged as to necessitate its abandonment in some districts. It was found there that the cotton was more prone to attack when growing in wet low-lying hollows, and that it was more profitable to plant in March or April at the end of the rainy season than in November or December at its commencement; although the crop sown in March or April does not consist of such large plants as one put in the commencement of the rainy season, it was much less prone to attack by bacterial blight. The writer lays much emphasis on the speedy destruction of the old plants as soon as the crop has been removed, and also calls attention to the fact that care should be taken to avoid using seed for planting purposes from a plantation already infected, and to the advisability of disinfecting all seed.

Although the disease does not assume such serious proportions in the West Indies, yet it is sufficiently prevalent to justify further investigations, and it is proposed during the coming season to institute field experiments with a view to determining the following points:—

(1) The general prevalence of the disease.
(2) The approximate date of the first attack.
(3) The approximate dates of the period of greatest prevalence.
(4) The stage of the boll at which it is most prone to attack.
(5) The connexion between the two forms of the disease.
(6) The effect of climate and soil.
(7) Its relationship, as far as possible, to angular leaf spot.

For this purpose, it is suggested that three or four fields of cotton in each island, situated on as many different types of soil as possible, might be kept under careful observation throughout the coming season. The points to be observed are the date of the first appearance of angular leaf spot and the general weather conditions prevalent at the time, the date of the first appearance of the diseased bolls and the approximate age of such bolls, the general abundance of angular leaf spot and the general conditions of weather throughout the season. Once the disease has made its appearance on the bolls, a few trees might be chosen each month at random in different parts of each field, and all the bolls from these picked. The percentage of total diseased bolls for each field could then be estimated from the percentage of these in those gathered. This would give an idea of the prevalence of the disease during each month. In addition to this, the diseased bolls obtained at each picking might be roughly sorted into young, half-grown and full-grown, and the percentage of each in the total number of diseased bolls picked might be recorded. This would show at what stage the bolls were most prone to attack, taking into account the records throughout the whole crop.

THE COMING COTTON-GROWING SEASON.

As the time of planting for the next cotton-growing season will soon have arrived, it is natural that planters should be seeking indications that will form a guide in the matter of deciding upon the area to be devoted to this crop. The experience that has been gained in the past in cotton-raising will, in individual cases, go a long way toward giving the information that will assist in arriving at a decision, but this must be supplemented by a knowledge of the prospects of a good demand for cotton, with reasonable prices.

Information has been received that, owing to the failure of the Egyptian crop, and to the scarcity of high-class Upland cotton, there has been a considerable increase in price, as regards good staple cotton, relatively to that of the ordinary cotton. That an actual increase has taken place is shown by the lists of prices obtained throughout the West Indies, published recently in the *Agricultural News*. Such a condition leads to the reasonable hope that good prices will be obtained for West Indian cotton, at any rate in the more immediate future.

There is justification, under these circumstances, for advising that a moderate increase in the area under cotton cultivation in the West Indies should take place. This increase should, however, be made more especially on estates where the cultivation is conducted with great care, and where efforts are made seriously to obtain the best results from it. It should not result from the taking up of cotton-growing by those who have had no experience in this industry, for it is essentially one which requires good practical knowledge and serious care and trouble. This must be realized, as well, by those who have gained an intimate acquaintance with the work which is required for the raising of cotton; otherwise, the best plan would be for them to abandon all ideas of undertaking its cultivation

Particulars in connexion with the work that will have to be conducted on estates before the seed for the coming crop is sown were recently given on page 86 of the present volume of the *Agricultural News*, and the necessity for early planting, especially where there are liable to be attacks of the flower-bud maggot, was emphasized. Attention may be drawn again to the great importance of the destruction of old cotton plants before the new seed is sown. Every cotton planter should perform his share of this work, not only in his own interest, but in that of all those who are engaged in the industry. It is not sufficient for this to be done immediately before the seed for the new crop is sown; time should be allowed for such of the pests as have escaped destruction to be removed by natural agencies from the land occupied by the plants on which they were living, for it is conceivable that the disturbance entailed by the preparations for burning the old plants will assist in distributing the pests in such a way as to enable them to attack most readily any cotton that is planted soon after this has taken place. It is hoped that planters will give this necessary and important part of the routine in cotton cultivation the thought and attention which it merits.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number treats of the fungi in a broad and general way. It serves to bring together the different aspects in which the fungi may be regarded.

The abstract of the bulletin issued recently by the Hawaiian Sugar Planters' Association, dealing with the effect of the structure of sugar-cane on mill work, which was commenced in the last issue, is concluded on pages 162 and 163 of this number.

An interesting article on lemon cultivation, as it is carried out in Italy, is given on page 164.

Special attention is drawn to the articles relating to cotton, on pages 166 and 167.

The Insect Notes, which appear on page 170, deal with the black scale (*Lecanium nigrum*) and its parasite (*Zalophothrix mirum*).

An account of some useful trees is given on page 171.

Part VII of the series of articles on The Chief Groups of Fungi is presented on pages 174 and 175. In this, the Fungi Imperfecti are considered. It should be mentioned that Figs. 29 and 30 are after Griffon and Maublanc, Fig. 31 after van Hall and Fig. 32 after Massee.

Publications of the Imperial Department of Agriculture.

Volume X of the *West Indian Bulletin* is now being completed by the issue of the fourth number. This opens with a full account of the proceedings at the Agricultural Conference held in Antigua in January of this year, which contains the papers read at that conference, namely, Five Years' Working of the Antigua Sugar Factory, by L. I. Henzell; Muscovado Sugar-Making by Steam Boiling, by A. St. G. Spooner; Implemental Cultivation, by G. Moody Stuart; and Systems of Agricultural Education, by Dr. F. Watts, C.M.G.

This account is succeeded by the following articles: Notes on Some Cacaos at the Dominica Botanic Station, by Joseph Jones; The Root Disease of Sugar-cane in Antigua, by H. A. Tempany, B.Sc.; The Root Disease of Sugar-cane in Barbados, compiled from information received from J. R. Bovell, I.S.O.; and Disinfection of Imported Plants, by H. A. Ballou, M.Sc.

The first article, namely that dealing with certain cacaos growing at the Dominica Botanic Station, is illustrated by means of two plates showing plants of Alligator cacao (*Theobroma pentagona*), Tiger cacao (*T. bicolor*) and Monkey cacao (*T. angustifolia*) and pods of the two first-named species. The article on the disinfection of imported plants contains useful summaries of information respecting legislation in connexion with this in the West Indies, and of the methods of disinfection that should be employed for the different ways and forms in which plants are imported.

With this number of the *West Indian Bulletin*, the index, title page and table of contents of Volume X are included, so that the separate parts of this may now be bound together.

Bonuses to Labourers for Permanent Service.

The Antigua Sugar Factory Company has recently devised a scheme by which bonuses are to be paid as a reward for permanent and faithful service, to labourers in its employment. These are of two kinds, 'cash bonuses' and 'retirement bonuses', and to qualify for them, a labourer working for the company must have been in its service continuously and without a break for two years, and have performed his duties in a satisfactory manner; he is then regarded as a 'permanent worker', and his name is enrolled on a list kept by the company and called the 'list of permanent workers', to be kept there as long as he remains in its service and works satisfactorily. There are placed to the credit of every such permanent worker: (1) the cash bonus, which is a sum equal to $2\frac{1}{2}$ per cent. on his earnings during the year previous to his enrolment; (2) the retirement bonus, bearing interest in the same way. The former of these may be drawn out or left with the company, which pays 5 per cent. on it; the latter can only be drawn on satisfactory retirement, or at death.

The bonuses are purely of the nature of a gift, and the scheme can be terminated by the company at three months' notice.

The Leeward Islands Agricultural Department.

In his address at the opening of the session of the general Legislative Council of the Leeward Islands in Antigua, on April 5, 1910, his Excellency the Governor, Sir Bickham Sweet-Escott, K.C.M.G., drew the attention of the Council to the fact that, under existing arrangements, the Imperial contribution toward the support of the Leeward Islands Agricultural Department will cease on March 31, 1913.

The reply of the Council to the address contained the following: 'We note that under existing arrangements, the Imperial contribution toward the support of the Agricultural Department will cease on March 31, 1913; but we earnestly hope that a matter of such vital importance to the colony will receive the further consideration of His Majesty's Government, with a view to the grant being continued.'

Baobab Trees for Storing Water.

The *Kew Bulletin*, No. 3, 1910, gives an account of the way in which the natives of Kordofan, Soudan, use the trunks of living baobab trees (*Adansonia digitata*) for storing water.

For this purpose, in order to prevent the trunk from splitting when it is hollowed out, the large branches are first cut off close to it. A branch is left on the trunk to serve as a platform, and a hole is cut in it just above this, through which it is hollowed out. The water for storing is collected in a shallow basin, 20 to 25 feet in diameter, round the bottom of the tree: from this, the tree is filled after a storm. The water stored in this way remains perfectly good until after the end of the next hot season.

In some trees, this artificial preparation is not required, as they are naturally hollow, and possess a hole at the top of the trunk between the branches, through which the water gains entrance. Much of the water collected runs down the branches, which act as gutters. Trees of this kind are called 'Lagai', and are valued highly by the Arabs.

Forestry in New Zealand.

An abstract of a report, issued by the Department of Lands and Forestry in New Zealand, which is given in the *Board of Trade Journal* for January 27, 1910, shows that the area in that country still covered with forest is about 17,074,000 acres, which is a little more than one-quarter of the total area. An estimate which is given of the total amount of timber that may be useful for commercial purposes, growing in the Crown and State forests, and on private and native freehold land, shows this to be about 33 billion superficial feet. In the year 1908, the output of sawn timber was nearly 414 million superficial feet.

Up to March 31, 1909, planting for reafforestation had taken place on 12,175 acres; of this area, 2,709 acres were planted in 1908. It is expected that the trees grown in this way will produce an appreciable quantity of timber for milling purposes in fifty to sixty years from the present time, and that the yield of each successive year after this will give a further supply.

The Action of Manganese Salts on Growing Plants.

According to the *Journal d' Agriculture Tropicale* No. 105, 1910, the *Bulletin Economique de l'Indo-Chine* gives an account of several experiments that have been carried out at the Tokio University, which have shown that the salts of manganese in small quantities are capable of affecting the growth of plants, and that they become rapidly injurious in larger quantities.

The same journal draws attention to work which has been done in Hawaii, showing that the best soils for pine-apples are those which contain about 5·61 per cent. of manganese sesquioxide, while the least suitable only contain 0·37 of this substance, and in so doing points out that probably, in the near future, the salts of manganese will take a general part in manuring.

The Amount of Lime in Basic Slag.

The *Annual Report*, for 1909, of the Rothamsted Experimental Station gives an abstract of a paper, in which the results are presented of an examination of the amount of free lime contained in basic slag. It was observed that the proportion of lime in this product is much smaller than that which is usually considered to be contained by it. The quantity found was 5·29 per cent. to 1·28 per cent., in freshly ground samples. The best method for estimating the amount of free lime in the basic slag was discovered to be one which consisted in extracting the finely ground slag with cold water free from carbon dioxide, and titrating the extract obtained. The suggestion is made that, in the early days of the manufacture of steel by the Bessemer process, basic slag contained a greater proportion of free lime than it does at the present day, just as it was usually poorer in phosphoric acid.

Trials with Calcium Cyanamide and Nitrate of Lime.

The *Journal of the Board of Agriculture* for March, 1910, contains an article by A. D. Hall, which presents the results of experiments designed to compare the manurial effect of calcium cyanamide and nitrate of lime with one another, and with nitrate of soda and sulphate of ammonia. In each case the plots treated with the particular nitrogenous manure received a dressing of superphosphate of lime, while the control plots received superphosphate alone. In all cases, the plots treated with nitrogenous manures showed a large return; this was chiefly due to the initial poor condition of the land. In a comparison of the effects of the nitrogenous manures, it was found that the variations in the yield caused by them were within the limit of experimental error, so that the conclusion is reached, as regards the Rothamsted soils, that any of these manures will serve as well as the others. In a general way, the result of the experiments is to show that the character of the soil and the relative price of the manures per unit of nitrogen should be the chief considerations in deciding which of them should be employed.

INSECT NOTES.

THE BLACK SCALE AND ITS PARASITE.

With the re-establishment of the cotton industry in the West Indies during the past seven or eight years, has come a tremendous increase in the numbers of certain pests, which previously for many years were so few as to be insignificant, or were entirely unknown.

In 1903, the cotton worm made its appearance in enormous numbers in nearly all the cotton-growing islands; in the same year the leaf-blister mite caused much loss to cotton growers in Montserrat, and it soon became known in all the other islands of the Lesser Antilles, except Barbados.

During the following year, cotton growers in Barbados suffered much loss from the attacks of the black, or Hibiscus, scale (*Lecanium nigrum*), and these continued each year until 1907-8. This same scale insect has attacked cotton in other islands, but it does not seem to have been at any time, in any other place, such a severe pest as it was in Barbados between the beginning of 1904 and the end of 1907.

Black scale has been a serious pest most often when old infested cotton has been allowed to remain standing up to, and after, the time for planting the new crop. A case in point was noted in an earlier number of the *Agricultural News* (see Vol. V, p. 42). An account was given of the loss occasioned on an estate in Barbados where old cotton plants were left standing until the young ones were several weeks old. There were two fields of this young cotton, one of which, directly to leeward of the old field, was a total loss; the other, across the wind from it, was nearly in the same case.

Many other instances have been observed where young cotton has been infested directly from the old plants left from the previous season's crop. In other cases, it has not been easy to determine exactly where the infestation had its origin. The black scale, however, has a long list of food plants some of which might easily serve as a starting point in the attack on any field.

When the black scale first became a pest, it was noticed that many of the insects had the characteristic round holes in the back which indicated that the parasite had emerged from them. Several attempts to obtain this parasite were made, and though the pupal stage was often found, no adults were procured until August 1907. At this time, Officers of the Department visited several estates where cotton from the previous season's crop was still standing. The owner of one of these stated that the black scale, though present in considerable numbers, was not a serious pest on that estate. A short search revealed the presence of a parasite, and it was found that a large proportion of the scales were parasitized. Immediately after this, the parasite was found in all parts of the island, and the black scale, which had been counted by many planters as the worst pest of cotton, began to be less serious. The parasite, which was named through the kindness of Dr. L. O. Howard, by Mr. J. C. Crawford of the U. S. Department of Agriculture, was found to be new to science. Not only was it a new species, but it represented also a new genus. It is likely that this parasite (*Zalophothrix mirum*) has been the controlling influence in the spread of the black scale (*Lecanium nigrum*) for a long time, for the scale insect has been present on certain plants and has not often become such a serious pest as to attract more than passing notice, until the great increase of the area planted with cotton provided an abundant supply of food and favourable conditions for its rapid development.

On a certain estate in Barbados, the old cotton remaining in the field in August 1907 was literally covered with black scale, and weeds of several kinds were thickly infested. This old cotton was removed soon after, but the succeeding crop was badly infested from these fields. The parasite was found in this field about this time. In April 1908, fields on this estate were examined, and it was found that, although the attack of black scale had been very severe, and many plants were dead, apparently as a result of this attack, the numbers of the scale were much less, and a very large proportion of those remaining were parasitized.

At the present time (May 1910) there are fields of old cotton on this same estate in which there are no black scales, and this is true of many similar fields in other parts of the island. The black scale, which only three years ago was counted the worst pest of cotton in Barbados, seems to be no longer a pest.

All attempts to control this insect by spraying were found to be rather expensive and unsatisfactory, but the natural method of control has been successful. This consists of the removal of all old cotton before planting new fields in the same vicinity; the piling of all such cotton for a few days to allow for the escape of the parasites then in the scales; and the introduction of them into fields infected with it. The introduction of the parasites is a very simple matter and consists in collecting scale-infested twigs from fields where parasites are known to be present, and tying them to the branches of the cotton plants, where the infestation is beginning.

Zalophothrix mirum is widely distributed throughout the West Indies, and by its action has probably prevented the black scale from becoming a pest in those islands. The greater amount of uncultivated land and the smaller proportionate acreage of cotton provided conditions more natural than those which existed in Barbados, and the pest never had the opportunity to develop, away from its parasite, to the same extent. The introduction of the parasite into fields infested with black scale was carried out on several estates by Mr. J. R. Bovell, Superintendent of Agriculture, Barbados, with such good results that this is now recommended as a matter of general estate practice. In the same way that planters apply Paris green when the cotton worm appears, so should they introduce parasites when black scale does so. On every estate, a sharp lookout should be kept for the first appearance of black scale, just as a watch is maintained diligently for the cotton worm, and twigs from some plant, such as cotton or Hibiscus, on which black scale occurs, and is parasitized, should be collected and distributed in the newly infested field.

In addition to the parasite of the black scale, which is referred to in the preceding article on this page, there are other beneficial insects which are worthy of mention at this time.

The parasite of the white scale (*Chionaspis minor*) has been known for some time, and it exercises such good control that the white scale rarely becomes a serious pest on cotton, though it is generally present toward the end of the season. Several parasites of the cotton worm are known to occur in the West Indies, and it is probably largely due to the action of these beneficial insects that there have been no attacks of this pest in these islands during the season just past. Among these parasites may be mentioned: *Trichogramma pretiosa*, a parasite of the egg, and *Chalcis annulatus* and *Sarchophaga trivittata*, which attack larvae and pupae. The predaceous insects have also probably been of great service in this matter, and among the chief of these may be mentioned the species of *Polistes*, including Jack Spaniards, wild bees and cow bees.

AN ACCOUNT OF SOME USEFUL TREES.

Leaflet No. 1 of 1910, of the Agricultural and Forestry Department, Nyasaland Protectorate, entitled *Some Notes on Tree Planting in the Shire Highlands of Nyasaland* contains interesting information concerning several useful trees. The Eucalypti dealt with include *Eucalyptus affinis, acmenoides, citriodora, longifolia, maculata, paniculata, pilularis, punctata, rostrata, rudis, robusta, saligna, sideroxylon, Smithii,* and *tereticornis;* all these, except *E. robusta* and *E. Smithii,* yield valuable timber. From the leaflet the following particulars are taken:—

Eucalyptus affinis.—Timber said to be hard and tough, somewhat greasy to the touch, and very durable.

Eucalyptus acmenoides (White Mahogany).—Very durable; excellent for posts, piles, girders, etc.; useful for general building purposes (Maiden).

Eucalyptus citriodora (Lemon-scented Gum).—Used as an ornamental plant on account of the scent of its foliage. Difficult to transplant, but grows well in suitable situations. Useful for ship-building, paving, railway ties, bridge-building, carriage-making and for railway coaches (Maiden).

Eucalyptus longifolia (Whoollybutt).—Grows best on deep alluvial soil. Timber reddish in colour, hard, interlocked and very durable.

Eucalyptus maculata (Spotted Gum).—Timber durable, and easily split; useful for waggon-work, cart shafts, ship-building, etc.

Eucalyptus paniculata (White Ironbark).—There are three other ironbarks besides this species, namely, *E. crebra, E. siderophloia* and *E. sideroxylon.* According to Maiden, Ironbark is the strongest and most durable wood of New South Wales. It is useful wherever great strength is required, for instance, for railway sleepers, posts, naves, spokes, shafts and framing, in waggon and carriage building; for large beams in buildings, especially where these are likely to be subjected to very great weights.

Eucalyptus pilularis (Blackbutt).—Suitable for ornamental purposes, as it branches extensively and has a thick foliage. Useful for house-building, ship-building, as bridge planking and as wood paving (Maiden).

Eucalyptus punctata (Grey Gum).—Produces heavy branches when it is widely spaced, so that it is suitable for making avenues and shelter belts. The timber is useful in waggon-work and carpentry.

Eucalyptus rostrata (Red Gum).—Can be grown in many varying situations; the timber from trees on hilly ground is somewhat lighter than that produced in rich soil with a good rainfall. Specially useful for fencing posts, piles, railway sleepers, veneers, street paving and parquet flooring. Withstands the action of the water, the white ant and Teredo (Gill). The tree has a spreading habit, which makes it well adapted for avenues and wind-breaks. The wood gives an excellent fuel.

Eucalyptus rudis.—When planted widely, it branches low down on the trunk, and thus makes a useful tree for avenues and shelter belts. The timber is said to be durable.

Eucalyptus robusta (Swamp Mahogany).—Only grows well in moist soil or drained swamps. The timber is of little value. May be planted for the purpose of drying up swamps.

Eucalyptus saligna (Flooded Gum).—Grows rapidly in deep soil. The timber possesses great strength and durability; it is useful for beams, sleepers, and general building purposes. The tree produces clean, straight poles.

Eucalyptus sideroxylon (Red Ironbark).—Like the other ironbarks, this produces a timber of great durability.

Eucalyptus Smithii (Gully Ash).—Only suitable for ornamental and shelter planting; yields a very good oil. Is of slow growth.

Eucalyptus tereticornis.—A species closely allied to *E. rostrata*, and like this plant it can stand a wide range of temperature and great variation in soil. Suitable for planting in dry localities. Its timber is useful in the same ways as that of *E. rostrata.*

Among the other trees mentioned in the leaflet are the Norfolk Island Pine (*Araucaria excelsa*) and the Kauri Pine (*Dammara australis*). The former of these is a lofty tree, which is now widely cultivated in tropical regions. It grows well on deep, open soil, and yields a timber which is useful for building purposes and general indoor work. According to Veitch, the Kauri pine yields resinous products which are little inferior to the best of those given by the Coniferae. The same authority states that the timber is straight in grain, very strong, durable and elastic, and that it can be employed for every purpose for which timber is in request.

THE CAPONIZING OF FOWLS.

Enquiry has been received recently by the Department as to the way in which the operation of caponizing fowls should be conducted, and as to where instruments for the purpose may be obtained. It may be useful to state that such instruments may be procured from Messrs. Griffith, Turner & Co., 205, North Paca Street, Baltimore, Mo., U.S.A., at the price of \$2·75 or \$3·00 (catalogue 23, page 71), or from Peter Henderson & Co., 35 and 37, Cortlandt Street, New York, U.S.A. Each set of instruments is accompanied by a full account of the way in which the operation should be performed.

The best time for operating is when the birds weigh $1\frac{1}{2}$ to 2 lb., or when they are three to four months old. They should not be over six months old, on account of the greater danger, at this age, of injury being done to the spermatic artery, by which the fowl will be caused to bleed to death.

In preparing the fowls prior to the operation, it should be made certain that the intestines are completely empty, in order that they may be out of the way when the testes are being removed. This can be done by shutting up the fowls and keeping food and water from them for twenty-four to thirty-six hours before the operation. A good light is required for this, and it is thus advisable that it should be performed out of doors.

After the operation has been made, the birds should be provided with shelter, food and water in a closed yard where they will not be disturbed and where no perches are provided. Food may be given immediately, and may well consist of water and soft feed, together with skim milk. The part where the operation has been performed should be examined from day to day for about a week, in order to ascertain if air is collecting beneath the skin; if this is the case, the skin should be pricked with a clean knife or needle, and the air pressed out.

In feeding capons for the table, it should be remembered that for several months after caponizing, a growing ration, that is one containing a large proportion of nitrogenous food bodies, is required. Good results have been obtained with a somewhat more fattening ration than that which should be given to laying hens.

GLEANINGS.

The amount of Egyptian cotton that was exported from Alexandra to the United States of America during 1909 was valued at £2,900,000. In 1908, the value was £1,102,000.

At a recent meeting of the Royal Horticultural Society, it was decided to recommend that an International Horticultural Exhibition should be held in May and June, 1912.

The quantity of cacao shipped from Trinidad during the months January to April, 1910, was 25,498,039 lb. The corresponding quantities for 1909 and 1908 were 25,101,356 lb. and 23,558,790 lb., respectively. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, April 1910.)

It is probable that Mr. Fielding and Mr. Paterson will join the English members of the Royal Commission on Trade relations between Canada and the West Indies at the end of this or next month, when further evidence in connexion with this subject will be taken in London.

An account of experiments described in *Gleanings in Bee Culture* for April 15, 1910, demonstrates the importance of the supply of water for bees. It was found that half a pint of clean water could be consumed by a good colony in two hours and twenty minutes, and that the greatest amount of water is required during the breeding season.

The *Textile Mercury* for April 2, 1910, states that it was reported at a recent general meeting of the French Colonial Cotton-Growing Association that the cotton produced in the French colonies or Protectorates has increased from 164,000 kilos. in 1907, to 238,000 kilos. in 1909; this comes chiefly from Dahomey and the Soudan. It appears from experiments that conditions in Senegal are suitable for the cultivation of the best varieties of Egyptian cotton.

A sample of crushed Guinea corn heads, prepared under the direction of Mr. A. St. G. Spooner, Antigua, has been received at the Head Office through Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands. According to Mr. Spooner, stock will readily consume the corn so prepared, even when it contains a certain proportion of the stalks; this is important, in view of the difficulty of cleaning heads of Guinea corn for the purpose. The machine used in the operation is called the Imperial Kelly Duplex Grinding Mill, and is manufactured by the Duplex Mill and Manufacturing Company, of Springfield, Ohio.

The *Monthly Consular and Trade Reports* for February 1910, contains an account of a method for the utilization of the 'mortar' which is used in the purification of sugar in refineries. The treatment consists in adding slaked lime and passing carbon dioxide, when potassium carbonate is precipitated and brings down the organic compounds in the liquid, together with phosphoric acid. The precipitate is separated by filtering, dried, and used as manure

H. M. Consul-General at Mexico City reports that there has been a great increase in the last three years in the production of Guayule rubber in the Republic. The exports of this product in the year ended June 30, 1909, were valued at £463,567, as against £125,852 in 1907-8; the exports in the six months July to December 1909 were valued at £449,113. The area under the plant is stated to be 30 per cent. greater during this year than in the year before. (The *Board of Trade Journal*, April 14, 1910.)

The *Annual Report of the Agricultural Stations*, Eastern Bengal and Assam, 1908-9, shows that the following canes, B.147, B.1753, B.376 and B.208, received from Barbados in May, 1907, have been grown successfully at Jorhat Agricultural Station. The juice of all the varieties was found to be rich in sucrose and very low in glucose, but it is stated that experiments on a larger scale, lasting for several years, are required before a definite conclusion can be reached as to the suitability of these canes for the district.

The *Report on the Progress of Agriculture in India*, for 1907-9, gives an account of the work that is being done in India in the direction of introducing improved tillage implements among the small cultivators in that country. In the United Provinces, village agencies have been formed, which are managed by local agents who lend or sell the implements. Further help is given by the agricultural assistants, who visit the cultivators, ascertain if the instruments are working properly, and arrange for repairs. The system appears to answer satisfactorily.

With reference to the announcements in the *Agricultural News*, Vol. IX, pp. 60 and 156, of the forthcoming International Rubber and Allied Trades Exhibition, it should be stated that this will be held at the Royal Agricultural Hall, Islington—not at Olympia. Information received from the organizing Manager, Mr. A. Staines Manders, shows that already, nearly every rubber-growing country in the world will send exhibits, and that it is advisable, in view of the demand, that intending exhibitors should secure space as soon as possible.

The prospectus of an organization called the British Honduras Rubber Company, Limited, has been issued recently. According to this, the area at present cultivated by the Company is about 1,240 acres, which chiefly contains rubber and cacao; there is in addition, a large area which is cleared and used for pasture. An estimate states that there are 166,000 trees of *Castilloa elastica* on the estate, the age of these being between three and eleven years. More than half of them are ready to be tapped, and it is thought that they will give an annual yield of about 144,000 lb. of rubber. This quantity is expected to increase in future years, as the fresh plantings attain maturity. It is proposed to plant annually 50,000 rubber, and an equal number of cacao, trees.

STUDENTS' CORNER.

JUNE.

FIRST PERIOD.

Seasonal Notes.

In many cases, where the cane has been removed from fields for the present crop, the underground system will be allowed to remain in the soil, in order that ratoons may be obtained in the next season. Tillage of the ratoons is usually effected. Discuss the possible advantages and disadvantages of such tillage, especially with reference to the structure of the underground system of the sugar-cane. (See *West Indian Bulletin*, Vol. X, pp. 117-21.) Why is trash often spread over the surface of the soil in fields of ratoons? Where the cane stumps are removed in order that the land may be used for cotton or other crops, observe the condition of these as regards insect pests, such as the root borer, and in relation to fungus disease.

The observations made in connexion with the reaping of the cane will be continued until the end of the crop season, and a large amount of useful information will be obtained by conducting them in the mill yard, as the canes come in to be ground. It is here that indications as to the amount and kinds of the diseases that are attacking the canes are obtained most easily. In addition to this, the mill work will be observed, especially with the object of gaining a knowledge of the milling qualities of the different varieties of cane grown on the estate.

Why is cane juice treated with lime? How is the proper amount of lime for the purpose determined? In some cases, in the muscovado process, it is the custom to add a certain proportion of the lime to the liquor in the tayches. Why is this practice objectionable, and what effect is it likely to produce, in relation to the taste of the molasses made?

Before being crushed, all the cane coming into the sugar works should be weighed, whether this is necessary on account of the fact that some of it is being purchased from growers, or not. In this way, much useful information in connexion with the efficiency with which the several parts of the process are being performed will be obtained, and a useful control on the working will be supplied, so that the necessity for making such changes as will improve the output of sugar will be recognized. In the absence of regular weighing, much unsuspected loss will occur, and its adoption as a matter of routine will well justify any extra expense that may be incurred.

When the yams that have been allowed to remain in the fields have been dug, note should be made of the difference between these and the ones which were harvested at maturity, and stored. In planting yams, the sets (cuttings) should be passed through Bordeaux mixture; they will then germinate better, and are less likely to be attacked by insect and fungus pests. Where sets of different sizes are used for planting, the growth of the plants springing from the larger ones should be compared with that of the sprouts from those which are smaller. If pen manure is applied to the soil on which the yams are grown, a useful experiment is afforded by mixing the manure with the soil in one part of the area and applying it around the yams in the other, and noting the difference in yield from the two areas when they are reaped.

Note that the cotton that is picked latest in the season contains more stained lint than that which was produced earlier. Make observations to find out if all cotton staining is due to the cotton stainer, or if there are other causes of it. Examine carefully the lint as it comes from the gin, noticing the nature of the chief foreign substances that are mixed with it: consider if any greater care in picking would make such cotton cleaner. What is the true nature of the small, green bodies that are generally found entangled in cotton lint? If possible, examine the seed from plants that have been grown where seed selection has been carried out regularly, and that from plants produced where seed selection is not practised. Notice the variability of the latter seed, especially as regards size and the amount of fuzz on the individual seeds.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is the difference between light and heavy soils? How may heavy soils be made lighter?

(2) Why is the mould-board of a plough curved, and what is the effect of curves of different extent?

(3) How would you select seed for corn-planting?

INTERMEDIATE QUESTIONS.

(1) Describe the different ways in which sweet potatos are propagated. Does any of these methods afford special advantages?

(2) Give an account of as many methods as you can, for propagating the mango.

(3) How would you make a nursery for (a) sugar-cane seedlings, (b) cacao, (c) limes?

DESTRUCTION OF THE PRICKLY PEAR.

The Cape of Good Hope Department of Agriculture publishes, in the *Agricultural Journal of the Cape of Good Hope*, for March 1910, particulars concerning a mixture, known as Jansen's extirpator, which is successful in effecting the destruction of the prickly pear. It is made as follows: (1) $\frac{1}{2}$-℔. good, finely powdered lime and $\frac{1}{2}$-℔. sulphur are boiled for half an hour in 1 gallon of water, 1 quart of water being added to make up for evaporation; (2) $\frac{1}{2}$-℔. salt and $\frac{1}{2}$-℔. arsenite of soda are dissolved in 1 gallon of boiling water; (3) the portions of liquid thus obtained are mixed together to form the preparation.

The way in which the mixture is used is to make an incision, with a sharp knife, in one or more of the flat parts of the plant, according to its size; the cuts should be 2 or 3 inches deep. Where there are no branches, one incision, only, is required—at the top of the plant. The cut is made on the upper side of a flat portion of the stem, the knife being moved to and fro in order to enlarge it. It is then opened by giving the knife a half twist, and a small stone is placed in the incision in order to keep it open. The preparation is stirred well, and a little of it is poured into the wound from a suitable vessel. The poison travels through the plant, finally killing it.

Where the prickly pear grows in dense patches, it is necessary to effect its destruction in several stages. This is done by treating the plants on the outside of the patch, and then, when these are dead, applying the preparation to those which were growing next to them, and so on.

Spraying the mixture is of no avail. It is not known yet if the treated plants are poisonous, so that caution should be exercised where they are likely to be eaten by stock.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

PART VII.

THE FUNGI IMPERFECTI. This is the last group of fungi to be considered. It contains many genera and species that vary immensely in form, but which are all characterized by the possession of conidia only, and by not forming any higher fructification, such as an ascospore. Most of them are species whose life-history has not been completely worked out, though they are suspected of being stages in that of various fungi belonging to known or unknown species of the Ascomycetes. Of late years, many of them have been more fully investigated, and in consequence have been removed and placed in different groups of the Ascomycetes. (See *Agricultural News*, Vol. IX, p. 142.) The group may be subdivided as follows:—

Sphaeropsidales.
Melanconiales.
Hyphomycetales.

The SPHAEROPSIDALES. These fungi produce conidia borne at the tips of slender conidiophores. The conidiophores, and frequently paraphyses, are contained in pycnidia, which often closely resemble the perithecia of the Pyrenomycetes. Two of the families in this cohort may be shortly considered.

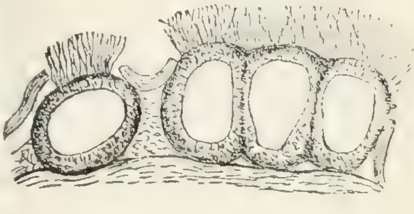

FIG. 29. DIPLODIA CACAOICOLA. Longitudinal Section of Pycnidia and Stroma.

In the Sphaerioidaceae, the pycnidia are always black in colour, and of the consistency of leather or charcoal. They may be free and superficial on the substratum, immersed in it, or grouped on a stroma. The conidia may be unicellular or multicellular, hyaline or dark brown. The minor characters, such as the presence or absence of a stroma, and the colour of the spores, serve to divide the different genera from one another. To this family belong the species *Diplodia cacaoicola*, causing die back and brown pod of cacao (Figs. 29 and 30), *Botryodiplodia* sp., causing root disease of coconuts, and one or two other allied species of economic importance in these islands.

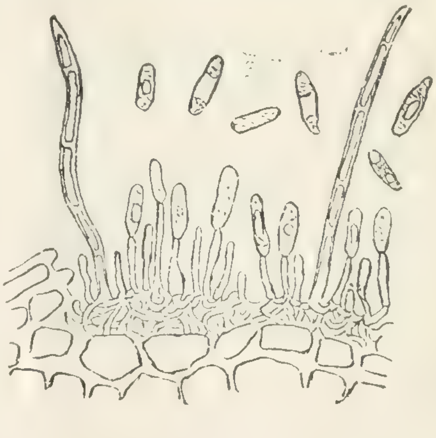

FIG. 31. COLLETOTRICHUM LUXIFICUM. Longitudinal Section of a Pustule, showing Conidiophores, Conidia and Hairs.

In the Nectrioidaceae, the pycnidia are fleshy in consistency, and frequently brightly coloured, never black; they may be free and superficial on the substratum, or grouped in a stroma. The conidia may be uni- or multicellular, hyaline or slightly coloured. To this family belongs the genus *Aschersonia*, two species of which are parasites on the white fly in Florida.

The members of these two families probably represent stages in the life-history of different members of the Sphaeriales and Hypocreales, respectively, in the Ascomycetes. (See *Agricultural News*, Vol. IX, p. 126.)

The MELANCONIALES. In this cohort, the conidia are produced on a more or less developed cushion or stroma, beneath the surface of the substratum. These cushions finally break through to the surface, in most cases, and form superficial pustules of spores, often coloured in the mass, as in the genus *Colletotrichum*, where they are frequently pink or yellow. The stroma is generally black, and this gives the fructifications a black appearance when young. In the case of *Colletotrichum falcatum* they remain black. In other cases, the spores are extruded in a tendril and are dark brown, or black in the mass, as in the genus *Melanconium*. The cohort contains only one family—the Melanconiaceae, but this embraces several important economic genera. It contains, for instance, the anthracnose fungi of the genera *Colletotrichum* and *Gloeosporium*. *Colletotrichum gossypii* causes anthracnose of cotton, *C. luxificum*, witches' broom of cacao (Fig. 31), and in addition several other species occur on cacao pods. (See *West Indian Bulletin*, Vol. X, p. 251.) *C. falcatum* causes red rot of sugar-cane, and *Gloeosporium musarum*, anthracnose of bananas. The melanconium stage of *Trichosphaeria sacchari*—the rind disease fungus of sugar-cane, was also at one time thought to be a separate fungus and included here. *Pestalozzia palmarum*, which attacks the leaves of cocoanut palms, is another member of this group.

FIG. 30. DIPLODIA CACAOICOLA. Longitudinal Section of a Pycnidium showing Conidiophores, Conidia and Paraphyses.

The HYPHOMYCETALES. These fungi are mainly superficial, sometimes only partly so; rarely endoparasitic on insects. The hyphae are often profuse, and bear free, naked conidia These are for the most part the fungi known as mildews and moulds. The cohort embraces four families.

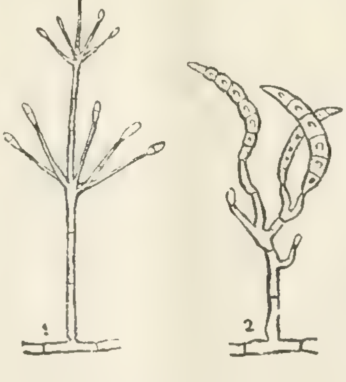

FIG. 32. FUSARIUM LYCOPERSICI
(1) Diplocladium Stage.
(II) Fusarium Stage.

In the Mucedinaceae, the hyphae and conidia are hyaline, or clear-coloured; never brown or blackish. The family is subdivided on the characters of the conidiophores and the

shape of the spores: whether they are borne singly, in chains, or in heads; if they are one- or more-celled; and similar characters. *Ramularia areola*, causing areolate mildew of cotton, is included in this family, as well as different genera causing mildews of grapes, roses and many other plants. Many of them have been shown to be stages in the life-history of different species of the Ascomycetes.

In the Dematiaceae, the hyphae, or conidia, or both, are brown or blackish. The genera are separated by characters similar to those dividing the genera of the Mucedinaceae. The group includes the genus *Cladosporium*, one species of which, *C. elegans*, causes a well-known disease of the orange; and the genus *Cercospora*, of which *C. gossypina* causes leaf spot of cotton. This fungus is really a stage in the life-history of *Sphaerella gossypina*, an Ascomycete. Other species are responsible for various leaf spots on coffee, ground nuts, and sugar-cane. The pine-apple disease fungus of sugar-cane, *Thielaviopsis ethaceticus*, is also a member of this family.

In the Stilbaceae, the hyphae are woven together to form a more or less erect, cylindrical stroma, from which conidiophores are produced, either terminally or all over. The conidia are one- or more-celled, and, together with the stroma, are frequently coloured. To this family belongs the genus *Isaria*, whose species are frequently parasitic on insects; larvae, pupae and the fully developed insects being attacked; many of the species are stages in the life-history of members of the ascomycetous genus *Cordyceps*. (See *Agricultural News*, Vol. IX, p. 30.) Another genus in this family is that of *Stilbella*, of which *Stilbella flavida* has recently been shown by Massee to be a stage in the life-history of the Ascomycete *Sphaerostilbe flavidum*. The conidial stage has long been known as causing the important coffee disease of the New World. (*Agricultural News*, Vol. VIII, pp. 395 and 411.)

In the Tuberculariaceae, the hyphae and conidiophores form a conidial patch or *sporodochium*, which is usually disc-shaped or effused, and frequently coloured. The conidia may be uni- or multicellular. The genus *Fusarium* is contained in this family. Fig. 32 shows two stages in the life-history of *Fusarium lycopersici*, which causes sleeping disease of tomatos. Many of its species are stages in the life-history of different species of *Nectria* and allied genera. The genus *Microcera* is also included here. One species, formerly known as *Microcera coccophila*, is common in these islands as the usual form of the red-headed fungus of scale insects (*Sphaerostilbe coccophila*), which is closely allied to the nectrias.

These, then, are the main divisions of the fungi. In order to present a more concise idea of their relationships, a tabular diagram will be given in the next number of the *Agricultural News*, which is intended to summarize as simply as possible the main points in the information included in this series of articles.

The Black Fungus in Montserrat.—Some croton plants have been received recently from Mr. W. Robson, Curator of the Montserrat Botanic Station, which showed the presence of a black fungus resembling, as he pointed out, *Myriangium Duriaei*, the parasitic fungus of the snow scale (*Chionaspis citri*), a well-known parasite of the lime. Further examination revealed the presence on the plants of an allied insect, *Chionaspis biclavis*, on which the fungus was parasitic. This is of interest, since the scale is one of the burrowing species, and the occurrence of the fungus upon it has not been recorded previously in the West Indies. The fungus was, however, found on the insect by Parkin, in Ceylon, as is recorded in the *Annals of the Royal Botanic Gardens*, Peradeniya, Ceylon, Vol. III, Part I, p. 32.

THE EFFECT OF ELECTRICAL DISCHARGES ON GROWING PLANTS.

An account of work which has been undertaken by the Department of Economic Biology, Bristol University, for the purpose of ascertaining what effect there is, if any, on the growth of plants, when they are subjected to a silent electric discharge, is given in the *Journal of the Board of Agriculture*, April 1910. In the trials, it is assumed that benefit accrues to a plant when a small electric current is passed through it, so that its yield is increased, and the time which it takes to obtain maturity is lessened. It is probable that this really takes place through an increase in the slight electric current which is always passing through the plant owing to the fact that the atmosphere above it is at a higher potential than the plant itself.

At present this is only an assumption, and much more work will have to be done before decided opinions on the subject can be gained. The present position of the controversy may be summed up in the words of the article as follows: It is sufficient to say that electric currents are reported by many observers to have an optimal value for the plant they are traversing, an optimum which probably is variable for different plants and for the same plant at different times; and that up to this optimum, increase in the strength of the currents leads to increased growths, more rapid germination, increased storage of food, and so on, but beyond this strength, the current rather inhibits vital activities and tends to lower the resultant yield from the plant.

The experiments seem to indicate that more importance should be attached than is usually the case to the effect of the current in accelerating the development of the crop. Such an acceleration would often have the effect of bringing it about that the crop is gathered under better circumstances than if it had had to remain until the usual time of harvest. There is the additional consideration that the existence of such acceleration denotes that the vitality of the plant has been raised, and this would have an effect in increasing its power to resist disease; actual indications of such increase have been obtained, but they are not conclusive, owing to the conditions under which the experiment was conducted. Some investigators have stated that they have noticed increased chemical activity in the electrified plants, especially Pollacci, who has obtained indications that leaves can manufacture carbohydrates, using the carbon dioxide in the air, when they are traversed by an electric current, even when there is not sufficient light for the purpose.

In interpreting the results of work of this kind, regard must be had not only to the effect of the current on the plant itself, but also, on the contents of the atmosphere and the soil. The presence of the electric discharges causes a combination of the oxygen and nitrogen in the air, so that it is possible that ultimately, there is a very small continuous addition of nitrates to the soil in which the plants are growing. It is also very likely that the current will have its effect on the soil bacteria, and thus upon the interchange that is taking place between the soil and the roots of the plant; the knowledge, however, of this part of the subject is too small for any definite conclusion to be given.

The results presented at the end of the paper would appear, in a general way, to indicate that there is a practical increase in the yields of crops when the growing plants are submitted continuously to the influence of a high-tension, silent, electric discharge.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, May 10, 1910; Messrs. E. A. DE PASS & Co., April 15, 1910.

ARROWROOT—St. Vincent, 1¾*d.* to 3¾*d.*
BALATA—Sheet, 4/8; block, 3/11 to 4/- per lb.
BEES-WAX—£7 17*s.* 6*d.* to £8 2*s.* 6*d.*
CACAO—Trinidad, 52/6 to 62/- per cwt.; Grenada, 49/- to 54/- per cwt.; Jamaica, 47/6 to 53/6.
COFFEE—Jamaica, 40/- to 55/-.
COPRA—West Indian, £28 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 20*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
HONEY—26/- to 32/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/-; concentrated, £18 10*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Steady.
PIMENTO—Common, 2⅛*d.*; fair, 2$\frac{3}{16}$*d.*; good, 2¼*d.* per lb.
RUBBER—Para, fine hard, 10/7, fine soft, 10/4; fine Peru, 10/5 per lb.
RUM—Jamaica, 2/1 to 5/-.
SUGAR—Crystals, 18/6 to 20/6; Muscovado, 14/- to 15/9; Syrup, 13/3 to 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., April 29, 1910.

CACAO—Caracas, 13c. to 13¾c.; Grenada, 10¾c. to 11¼c.; Trinidad, 11½c. to 12c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $25·00 to $26·00; culls, $15·00; Trinidad, select, $25·00 to $26·00; culls, $15·00 per M.
COFFEE—Jamaica, ordinary, 9c. to 9½c.; good ordinary, 9½c. to 10c.; and washed, up to 11½c. per lb.
GINGER—9½c. to 12c. per lb.
GOAT SKINS—Jamaica, no quntation; Barbados, 47c. to 50c.; St. Thomas, St. Croix, St. Kitts, 43c. to 45c. per lb.; Antigua, 47c. to 50c., dry flint.
GRAPE FRUIT—$2·50 to $3·00 per box.
LIMES—$8·00 to $9·00.
MACE—29c. to 35c. per lb.
NUTMEGS—110's, 9c. to 9¼c. per lb.
ORANGES—Jamaica, $1·75 to $2·25.
PIMENTO—4¼c. to 4⅜c. per lb.
SUGAR—Centrifugals, 96°, 4·30c. per lb.; Muscovados, 89°, 3·80c.; Molasses, 89°, 3·55c. per lb., all duty paid

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Trinidad,—Messrs. GORDON, GRANT & Co., May 14, 1910.

CACAO—Venezuelan, $11·50 per fanega; Trinidad, $10·65 to $11·15.
COCOA-NUT OIL—98c. per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·60 per 100 lb.
DHAL—$4·40 per 2-bushel bag.
ONIONS—$2·00 to $2·20 per 100 lb.
PEAS, SPLIT—$6·30 to $6·40 per bag.
POTATOS—English, $2·00 per 100 lb.
RICE—Yellow, $4·35 to $4·40; White, $4·85 to $4·90 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., May 9, 1910; Messrs. T. S. GARRAWAY & Co., May 9, 1910; Messrs. JAMES A. LYNCH & Co., May 17, 1910.

ARROWROOT—St. Vincent, $3·40 to $3·75 per 100 lb.
CACAO—$11·00 to $13·00 per 100 lb.
COCOA-NUTS—$14·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
HAY—$1·20 to $1·60 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$1·00 to $3·00 per 100 lb.
PEAS, SPLIT—$6·10 to $6·75 per bag of 210 lb.; Canada, $3·00 to $3·60 per bag of 120 lb.
POTATOS—Nova Scotia, $1·00 to $2·75 per 160 lb.
RICE—Ballam, $4·33 to $4·80 (180 lb.); Patna, $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, May 14, 1910; Messrs. SANDBACH, PARKER & Co., May 13, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·00 per 200 lb.	$8·00 to $8·25 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	$1·00	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$4·00 per bag of 168 lb.	$4·00 per bag of 168 lb.
Green Dhal	$5·75	——
EDDOS—	72c. to 96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	3¼c. to 3½c.	3¼c.
Madeira	——	No quotation
PEAS—Split	$6·00 per bag (210 lb.)	$6·15 per bag (210 lb.)
Marseilles	$3·50	$3·50 to $4·25
PLANTAINS—	12c. to 48c. per bunch	——
POTATOS—Nova Scotia	$1·75 to $2·00	$1·75 to $2·00
Lisbon	No quotation	No quotation
POTATOS-Sweet, Barbados	$1·56 per bag	——
RICE—Ballam	No quotation	$4·75
Creole	$4·20 to $4·25	$4·20 to $4·25
TANNIAS—	$1·68 per bag	——
YAMS—White	$2·00	——
Buck	$2·40 per bag	——
SUGAR—Dark crystals	$3·05 to $3·10	None
Yellow	$3·70 to $3·80	$3·70
White	$4·00	$3·80 to $4·00
Molasses	$2·25 to $2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

DEPARTMENT OF SCIENCE AND AGRICULTURE, BRITISH GUIANA.

AGRICULTURAL INSTRUCTOR.

Salary, $960 per annum rising to $1,200 by $72.

(NOT ON THE FIXED ESTABLISHMENT.)

Applications are invited from candidates for the above post, who should be between twenty-three and thirty-six years of age. Knowledge of, and experience in, the growth of tropical products and of draining operations on low-lying land is of importance.

Candidates must submit with their applications, details of their training in Agricultural Science and in practical Agriculture accompanied, if feasible, by diplomas from the institution where trained, or of certificates in Agriculture issued by the Imperial Department of Agriculture for the West Indies, or the Department of Agriculture of any other tropical country, copies of satisfactory certificates of health and of character, together with copies of not more than three testimonials from their present and former employers.

2. Duties.—To give instruction in practical horticulture to farmers and settlers in the various districts of the colony, especially in connexion with the cultivation of rice, rubber, cacao, coffee, bananas and citrus fruit, and the care of live stock generally; to assist in the inspection of gardens attached to primary schools and in the examination of their pupils in the elements of agriculture; to assist in agricultural experiments and in the control of the district agricultural stations; to assist in the nurseries of the Botanic Gardens; and to perform such other duties as may be assigned to him by the Director of the Department.

3. The selected candidate will be required to sign a form of agreement previous to appointment.

4. Applications should be addressed to the Director of Science and Agriculture on or before May 31, 1910.

J. B. HARRISON,

March 23, 1910. Director of Science and Agriculture.

JUST ISSUED.

WEST INDIAN BULLETIN.

(Vol. X, No. 4.)

Containing: The Agricultural Conference in Antigua, 1910; Notes on Some Cacaos at the Dominica Botanic Station; The Root Disease of Sugar-cane in Antigua; the Root Disease of Sugar-cane in Barbados; Disinfection of Imported Plants; Title Page, Index and Contents.

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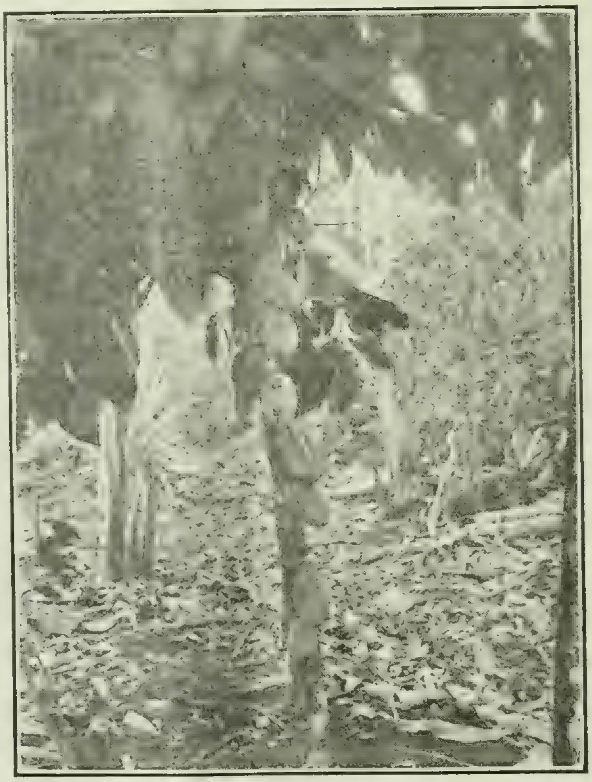

AGRICULTURAL NEWS

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CONTENTS.

Agriculture and the Supply of Labour.

THE conditions in the West Indies, as in most tropical countries, are such that nearly all labour may be considered to be agricultural. The chief source of wealth is the soil, and it is to this that man, aided by the changes that are brought about in it by natural agencies, applies his energies in order that he may provide himself with the means of subsistence, and may, in so doing, raise crops that will find willing purchasers in other countries. In this way, the population is supported, and a requisition is made upon other lands, whereby the means is provided for obtaining such articles as cannot be produced locally.

The consequence of the soil as the origin of the more necessary of the commodities consumed by man has been recognized for a long time, but there has existed, nevertheless, a tendency to underrate the importance and dignity of the labour by means of which, only, it can be made to yield the products that are of especial use to mankind. To this there has been added the mistaken idea that the duties of the direction of that labour could be assumed equally well by men of very different mental attainments, and that nothing in the way of special training was necessary or expedient, in order that those duties may be taken up in an efficient manner. The attitude of true students of the subject has always been of the opposite nature, for mention may be made of such early economists as Vauban, who stated that labour is the foundation of all wealth, and agriculture the most important species of labour, and William Petty, who wrote: 'Labour is the father and active principle of wealth, lands are the mother.'

Although this regard for the importance of the soil to man had an early origin, it was tempered, until recent years, by the idea that its value as a producer of crops must, of necessity, decrease continually; that is to say, the greater the amount of removal of crops from it, the smaller became its power to yield anew. This opinion was given an axiomatic value by economists of the school of J. S. Mill, who formulated the law of diminishing production from land, which stated that

every successive application of capital to cultivation must be less profitable than the first. If this was actually true, the logical course arising from it would be quickly to cease to employ capital for the working of a given area of cultivated land, after the first few crops had been taken from it, so that agriculture would soon consist chiefly in the exploitation of new land.

Practical experience and scientific experiment have demonstrated the fact that the limits of the ability of the soil to produce are definitely set by the supply of light, heat, air and water that is available for it, and for the plants growing in it. Agricultural research shows it to be increasingly probable that, until those limits are reached, the growth of the knowledge gained in the laboratory and the experiment plot, and the advance in the skill with which the land is worked, will tend, by themselves, to bring the cost of production on so-called worn-out soils down to the level of that on soils of greater fertility. Thus the time may be reached when the gains will be the same, whether the labour is being employed for inferior soils or for those which are superior, and the return from the capital used will be as great, near the ultimate point at which it can be invested usefully, as it is when it consists virtually of labour alone, applied to newly cultivated soils.

These considerations have reduced the question of the best use of the soil to one of labour, and the problem for the agriculturist will be to find the way in which he can employ most profitably, both from his own point of view and that of the labourer, the sources that are at his disposal. This problem will include the task of discovering the means by which he may be enabled to have a constant supply of efficient labour at his command; it will be readily understood that by 'labour' is not meant field labour, alone, but all the means for the provision of such human energy as is not employed solely in a directive and administrative capacity.

The question of the supply of labour is not, however, merely one of the future, as the outcome of the conditions that have just been described. It is a matter of the present, in many regions of the world, including parts of the West Indies. It is evident that one of the chief causes that may operate in the production of a shortage of labourers, is the creation of conditions, in another country, such that high wages are offered, in order to attract the worker, with the result that he yields to the temptation to make a test of the apparently better conditions in the new country. He cannot be expected to realize that the receipt of higher wages does not necessarily bring about an increase in comfort and material prosperity, and he does not recognize, while still in his native country, the value of the many ameliorating circumstances that enter into his daily life there, the sharing of which is not dependent on the possession of money. In making these statements, the value of emigration to a place where wages are higher, which arises from the opportunity to remit sums of money to those who are left behind, is not ignored. It is evident, however, that such emigration has a limit of usefulness in this direction, and that its interference with the provision of an adequate labour-supply may result in making conditions less favourable in the country which the emigrant has left.

In considering what steps should be taken in order that a constant supply of adequate labour may be ensured, where there are signs that this might become no longer available, assistance will be gained from a proper realization of the obvious fact that the labourer works solely in order that he may provide himself, and those who are dependent on him, with the means to live, together with as many luxuries as he can command. As time passes, the evidence of any sentiment of attachment to a particular employer or place is quickly becoming smaller. These conditions make it natural that the supply of labour should move in those directions where it appears that the greatest prices will be paid for it. This is no longer a local condition, for as has been considered already, it leads to emigration, and that the more easily, as means of transport are increased and made cheaper. The fact of practical value immediately suggested by this is that, if this unsteadiness of labour-supply is to be remedied, it must be made worth the labourer's while to remain where he is being employed; an appeal must be made to him through the provision of additions to his welfare; he must be convinced by a material argument which he is able to appreciate.

The way in which this argument may be provided is a matter for trial, and the application of the suggestions arising after experience. It will vary in different places, and will require modification as conditions change with time. Efforts toward its discovery are being made already; one of these, namely the scheme of giving bonuses for permanent labourers, adopted at the Antigua Sugar Factory, was described shortly in the last number of the *Agricultural News*, and it is of interest that this has proved itself worthy of extension. Such endeavours should result in adding the value of permanency to that of the presence of labour and, as regards the labourer, should enhance the sense of the value of his continuous work and of his self-respect.

SUGAR INDUSTRY.

INTRODUCTION OF SUGAR-CANES INTO MAURITIUS.

A *Memorandum of the Introduction of Sugar-canes to Mauritius* has been issued recently by the Mauritius Government. It is especially interesting, as it gives some indication as to the history of the sugar industry in that island.

It appears that the sugar-cane was imported into Mauritius in July, 1650, by the Dutch, from Batavia. At first the cane juice was only used for making a liquor called arrack, and it was not until 1744 that a sugar mill was erected. In 1816, soon after the British occupation of the island, the production of sugar had reached 4,000 tons per annum, from eighty-six mills. The canes chiefly cultivated were the white canes of Otaheite and Batavia, and the red one of Batavia. The continual growth of these in the same soil led to their becoming diseased, and in 1849 a group of planters subscribed a sum of money for the purpose of obtaining a new kind from Java. This resulted in the arrival in Mauritius, in 1850, of over a million cuttings, three varieties of which, namely, Bellouguet, Diard and Penang, gave entire satisfaction.

At this time, similar importations of cane were made from Ceylon, even though it was well known that these were infested with borers. On their arrival, a Committee was appointed to examine the canes, with the result that they were ordered to be destroyed. This precaution, however, did not prevent the introduction of *Diatraea striatalis*, which became a sufficiently serious pest for a Committee to be appointed in 1856 for the purpose of finding means of dealing with it. The recommendations that were made do not appear to have been of much avail, for the sugar-cane industry was saved from ruin in 1858 by the introduction of the Bamboo, or Batavian cane, and the Guinghan, or violet-striped cane.

In 1864, another enemy of the cane was reported as doing much damage in the sugar plantations of Réunion, as well as those of Mauritius. This was one of the Coccidae, called the 'pou à poche blanche' (*Pulvinaria gasteralpha*, Icery). This no longer exists in Mauritius, and it is suggested that its disappearance is due to a parasite.

From 1866 to 1870, new varieties of cane were received from Java, Trinidad, British Guiana, Queensland, New Caledonia, Egypt, India, Brazil, the Sandwich Islands, Réunion and Penang. Between 1862 and 1875, Mr. Lousier, who was manager of an estate in Mauritius, is said to have obtained a bud variation from a cane called Mignonne, which was itself a sport from a cane received from New Caledonia. It is this variety which is now known as the Lousier, and it has given rise in turn to the green-striped Lousier and the red-striped Lousier, from the latter of which the red Lousier is derived.

After 1877, other canes were introduced, chiefly from Fiji and the Sandwich Islands. This stage of the introduction of new canes was ended in 1883. During several of these years, other canes were received at the Botanic Gardens, but there is no record of the results which were obtained with many of these. The chief of the more modern introductions of canes took place in 1891, 1908 and 1909; among the last to be obtained were the New Guinea canes, Goro and Badilla.

None of the above introductions include seedling canes. The first of these were obtained from Barbados in 1891, through Kew, but, unfortunately, they all died before they could be propagated. In 1901, D.145, B.308 and D.130 were received through the Imperial Department of Agriculture for the West Indies, and propagated until 1905, when cuttings were distributed free to planters by the Chamber of Agriculture It is stated that D.130 has given very favourable yields in many localities, chiefly at low altitudes, and it is now cultivated on a large scale. Other importations of West Indian seedling canes have been made as follows: 1902, D.95; 1903, B.147; 1905, D.74, D 95, D.109, D.195 and B.208; 1906, D.195, D.74 and B.208; 1909, D.625 and B.147. All these have been propagated for distribution.

SUGAR CULTIVATION IN BENGAL.

An article in the April number of the *International Sugar Journal* deals partly with the state of the sugar industry in Bengal. It shows, first of all, that four kinds of sugar are chiefly produced in India; these are: (1) white sugar, which is almost entirely consumed by Europeans; (2) yellow sugar, which is made by concerns that are generally financed and controlled by Europeans, and is largely sold in the bazaars; (3) 'country' sugar, which is a fine variety of yellow sugar, very sweet but very expensive, made by native processes; (4) gur, which is a native variety of sugar consisting actually of cane juice evaporated to dryness, and containing 70 to 80 per cent. of sucrose.

The present article, which is to be followed by another, deals mainly with the making of the yellow sugar (No. 2). It is pointed out that conditions in India would seem to indicate that there is a specially good opening for central factories. The reasons for this are chiefly the following: the preference of the natives for goods of Indian manufacture; the conditions of rainfall and soil, which are particularly suitable to sugar-cane growing in those parts of India where sugar is made; the low price of sugar-cane, which can usually be obtained at 7*s.* per ton; the good prices that are offered for molasses; the provision of cheap labour by a population which is intelligent and hard-working.

The writer shows that there is room for the introduction of great improvements in the way in which the sugar-cane industry is carried on in India, and that there has been little progress in the matter for many years.

The kind of cane that is obtained for crushing is almost always the small green variety; this has usually a height of 6 to 9 feet, with a circumference, at the base, of 2 to 3 inches. Such canes, when their measurements are 6 feet and $1\frac{1}{2}$ inches, generally contain 12 to 15 per cent. of fibre, and give a juice having a purity of 78 to 84. The larger canes, such as Pansahi, are superior to these, sometimes giving a juice of purity 90 to 94, while the fibre content is 9·5 to 11. It is stated that there is little doubt that, with proper means of irrigation and manuring, better results could be obtained with the large canes, but the grower in India prefers small cane, because its production requires little trouble, and it is fairly free from pests, with the exception of the borer. For planting purposes, about 2 or 3 cwt. of the canes are placed in a ditch, covered with earth, and left for three weeks or a month. Those which have not sprouted by this time are rejected, while the others are planted at a depth of 3 to 4 inches, immediately behind the plough. The time of sowing is always between November and March, during the cold weather, and the cane continues to live through the dry months of March, April and May, without irrigation, and begins its full growth in June, when the rainy season commences. Where weeding is practised, one is given before the rains and one when they commence; no more cultivation takes place before the end of the growing season, in November or December.

FRUITS AND FRUIT TREES.

FRUIT CULTIVATION IN INDIA.

The Second Report on the Fruit Experiments at Pusa, by A. Howard, M.A., A.R.C.S., F.L.S. (sometime Mycologist on the staff of the Imperial Department of Agriculture), which forms Bulletin No. 16 of the Agricultural Research Institute, Pusa, contains an account of experiments that have been conducted in the treatment of soils under fruit trees. It points out that little or no attention appears to be paid, at present, to the tillage of fruit lands in India. In some cases, the plantations are under grass, in others the surface is almost entirely neglected, being covered with weeds and grass. Sometimes the trees are planted so closely together that no surface growth beneath them is possible, while it is a general rule that vegetables or bananas are generally grown, for profit, between the young trees. All this results in the production of fruit trees having a neglected and half-starved appearance. It was in order that information may be obtained, which would lead to the amelioration of these conditions, that the experiments at Pusa were commenced in 1905.

In each of these experiments, three plots were included, which received the following treatment: (1) normal cultivation, (2) no cultivation, but with the removal of weeds, (3) grassing down.

In the first plot, the tillage is carried out according to the best methods of England and the United States, so that the surface is kept free from weeds, the land is well cultivated in the cold weather, and a loose surface mulch, for the conservation of water, is maintained. While the trees are young, the soil is provided with a green manure by growing a cover crop of sunn hemp (*Crotalaria juncea*), which is ploughed in during the rains.

Weeds are kept out of the uncultivated plot, as far as possible, but this cannot be done perfectly on account of the quick growth of the common red weed of the plains (*Euphorbia thymifolia*), which flourishes under the special conditions.

On the grassed down plot the turf practically consists solely of *Cynodon Dactylon*, the 'devil's grass' of the West Indies. This grass is kept, as far as possible, free from other plants. It is maintained in a closely cut condition, by means of a lawn mower, and the cut grass is allowed to remain on the surface.

In the cultivation experiment, the normal treatment was only commenced when the plants were well established. It has therefore been in operation only two years, but the results obtained during this time are of a very definite nature, and show the value of proper tillage for fruit trees.

In regard to the non-cultivated plot, during the first year it showed no difference from the cultivated one. There is, however, a certain amount of difference to be seen at the present time, more especially in the fact that the foliage of the trees in the uncultivated plot has a paler green colour than that in the control plots. It is possible that the effect of withholding tillage will be more evident as the time of the experiment extends. The interesting observation was made that, owing to the absence of cultivation, the cost of keeping these plots free from weeds is almost as great as that of cultivating and weeding them in the ordinary way.

The effect of laying the plots down to grass is shown in a strikingly similar manner in the case of all the trees with which the experiments were made. The greatest damage appears to have been done in the case of limes, lemons, oranges, pumelows, plums, custard apples and loquats, many of the trees of which are dead, while the others are in a deplorable condition; the untoward effect seems to be especially shown in the case of the citrus trees. Peaches, guavas and figs have been affected to the least extent, though their growth is considerably checked; their better state may be partly due to the fact that they were more completely established than the others before the grassing down was commenced, and partly to the great vigour of these trees at Pusa. A review is given of recent work that has been conducted in connexion with the effect of grass on trees, and the author states that, in his opinion, the differences between the plots are due to the fact that there was always more moisture in the soil of the tilled plots than in that of the grassed down plot, so that a starvation effect was obtained. Observations are made on experiments that have been conducted in the United States, in which good results were obtained when apple trees were grown in soils covered by a deep mulch.

It is interesting to note, with reference to the experiments that have been conducted at Woburn, by the Duke of Bedford and S.U. Pickering, in the matter of the firm planting of trees (*Ninth Report of the Woburn Experimental Fruit Farm*, 1908), have been confirmed by the results of trials made in this direction at Pusa. It is stated that trees planted firmly in well moistened earth show an immediate development of the root system, followed by the growth of new leaves and of new wood.

THE PURIFICATION OF BEESWAX.

The melting of beeswax can be effected either by using sun heat, direct fire heat, boiling water, or steam. In a melted state, beeswax readily separates from such foreign substances as may be contained in it, and owing to its lower specific gravity, will float on the surface of the water.

A simple method of rendering beeswax, and one formerly adopted by bee-keepers in this country [England] and elsewhere, is to extract as much honey as possible from the comb, first by draining and then by pressure in a press of the ordinary copying-press type, and finally by melting it in presence of water, which dissolves out any residual honey which may cling to the pressed wax. While melted, the wax is strained through calico to remove solid impurities, and is finally remelted over a fire to remove water, after which it is poured into moulds to set. Care is required in carrying out the final melting, as burning may occur, and when this happens a dark-coloured wax of low market value is produced.

Another method, followed by bee-keepers who have not adopted modern appliances, is to place the comb, after the honey has been extracted, in a canvas bag, which is kept below the surface of water, contained in a copper or other large vessel, by being weighted with stones. If the comb contains 'brood', it is allowed to soak in water for twenty-four hours before being placed in the copper, the object being to fill the dry cocoons with water, which will prevent them from absorbing the melted wax. The water in the copper is next heated, and as the wax melts, it passes through the canvas bag and rises to the surface of the water, leaving behind in the bag all solid impurities. The bag is taken out of the copper and squeezed between two pieces of wood to extract as much wax as possible, and the surface of the melted wax in the copper is frequently skimmed to remove scum and other impurities. A cloth is then thrown over the vessel, and the wax and water are allowed to cool as slowly as possible. The wax solidifies into a cake, which can be easily removed from the water. On the under side of the cake there is usually a discoloured layer containing impurities, and this is scraped off and worked up with the next batch of crude wax. The remainder is broken up into small pieces, re-melted and poured into moulds to set. Provided that care is taken (1) not to boil the water too fast or for too long a time, and (2) to prevent burning during the final melting, this method produces clean wax of good colour; but if either of these precautions be neglected it becomes dry and brittle, and of a brownish hue. The outfit required for the foregoing operations is simple, and obtainable almost everywhere.

Of the modern appliances for rendering wax, one of the simplest is the 'solar wax extractor', which is in common use in the United States, Australia and elsewhere. This consists of a wooden box with a sloping, double-glazed lid. Inside the box, and raised some distance from its floor, an inclined tin tray is fixed. The comb is placed on the tray, the lid tightly closed, and the box exposed to the sun. The temperature inside the box rapidly rises, and when it reaches about 147° F., the wax melts and runs off the sloping tray into a vessel beneath, leaving impurities behind, caught by a wire gauze strainer. This appliance is admirably suited to warm countries, and wax obtained by its use is of good quality, and requires no further refining. It is, however, not suitable for rendering comb containing brood or other gross impurities. In treating comb of this description, it is best to extract the wax by one of the methods mentioned above, and then to clarify it by means of the solar extractor. Most of the other appliances are provided with a screw press, by means of which the wax is forced through strainers, after being melted by means of hot water or steam. (*Bulletin of the Imperial Institute*, Vol. VIII, p. 24.)

A QUICK WAY OF MAKING BORDEAUX MIXTURE.

The following extract, from the *Agricultural Bulletin of the Straits and Federated Malay States*, for April 1910, shows how assistance in the quick making of Bordeaux mixture in large quantities may be obtained in a simple way:—

The making of Bordeaux mixture on a large scale from stock solutions is greatly facilitated if some simple plant be erected. The erection consists of two elevated platforms. The higher platform is carried on four 9-feet 6-inches posts, 5 inches by 4 inches, sunk 2 feet 6 inches in the ground and well rammed. Joists, 5 inches by 4 inches, connect the heads of the posts, into which they are halved. An intermediate joist is halved into the middle of two opposite joists. The upper platform is 5 feet square, and consists of 6 inches by 1 inch boarding in the rough, laid to the edges. The lower platform, which is 6 feet 6 inches square, is similarly constructed, and is carried on sleepers, 6 feet long and 10 inches by 5 inches, set vertically and sunk 2 feet 6 inches in the ground and well rammed. The two structures are bolted together at the two back posts, and where the front post of the higher platform touches the joist of the lower platform.

On the higher platform are two 50-gallon dilution barrels, marked inside at the 50-gallon level, and fitted with taps. If possible, water should be laid on this higher platform. On the lower platform stands a vat (fitted with a tap) capable of containing 100 gallons. A short length of hose (canvas hose is convenient to use) is fitted to the taps of the dilution barrels and of the 100-gallon vat. The process of making 100 gallons of Bordeaux mixture is as follows: 8 gallons of the stock solution of milk of lime, and the same amount of copper sulphate stock solution (or 4 gallons only, if this has been made of the strength of 2 lb. of copper sulphate to the gallon of water) are carried up to the upper platform, and poured separately into the two dilution barrels, which are then filled with water up to the 50-gallon mark. The 50 gallons of milk of lime thus obtained in one of the barrels are stirred vigorously for a couple of minutes. A strainer is now placed over the vat, in such a position as to allow the hose from the taps of the dilution barrels to project into it. The taps of the dilution barrels are now turned on, and the contents of the barrel containing the lime being stirred continuously, the two 50-gallon barrels empty themselves through the strainer into the vat, filling it with 100 gallons of Bordeaux mixture. The whole process can be easily controlled by one man standing on the higher platform, as with his stirring-pole he can reach the taps and so regulate the flow if necessary, and also stir and clear the strainer, should this become clogged. The Bordeaux mixture is immediately ready for use, and can be run off from the top of the vat into the spraying machine. Thus all the labour and waste of time in handling the mixture are saved; and given some such plant, and stock solutions, 100 gallons of Bordeaux mixture can be prepared in a few minutes at any time.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 23, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, West Indian Sea Islands have been in fair request at steady rates. The sales comprise Barbados, Antigua, St. Kitts, Montserrat and St. Vincent, at prices ranging from 16*d.* to 22*d.*, the former being for Stains.

Late advices from America state that considerable replanting has taken place in Georgia, of Upland cotton instead of Sea Island, and we therefore expect that next season good prices will rule for West Indian.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 14, is as follows:—

For the past fortnight the receipts were only 39 bales, of which 36 bales were common stains, and were sold for France at 16c. Otherwise the market has been very quiet, with no demand for the few remaining crop lots, which are still being nominally held at 38c., 40c. and 50c.

COTTON-GROWING IN ANTIGUA.

A letter from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, shows that, owing to the unfortunate experience with cotton growing in Antigua, in the past, the area planted in the island during the last season has been the smallest since cotton has been grown there (see also *Agricultural News*, Vol. IX, p. 118). It is estimated, however, that 150 bales of 230 lb. each will be the total output for the past season; this gives a yield of 137 lb. of lint to the acre, which is far in excess of those obtained during the past few years. Mr. Tempany points out that, taking into consideration the circumstance that in some cases the cotton was grown as an intermediate crop between sugar-cane, and only gave one picking, and that in other cases the yield, for some unexplained reason, was small, this general yield gives occasion for a certain amount of satisfaction, as it tends to indicate that there is a more hopeful outlook for the industry in Antigua.

The suggestion is made, in view of the fact that cotton has been the means, during the past few years, of adding about £17,000 to the trade of Antigua, and in consideration of the greatly improved yield obtained during the past season, further efforts to revive the industry should be made. This suggestion is supported by the fact that the quality of the cotton produced recently has been good, excellent prices and yields having been obtained by at least two growers. It is of interest that the cotton raised by both of these growers was produced from selected strains of seed, originated by the Antigua Agricultural Department, by the method of selection of suitable plants. It is therefore believed that these better yields and prices are to a great extent the direct results of the work that has been performed in the matter of selection. It is thus suggested that the strains of seed originated in this way are suited especially to those parts of the island in which they have been successful. In the case of the two particular strains which have given the best results, one has shown itself superior in the limestone districts of the island, and the other on the heavier volcanic soils, so that planters will be able to select seed in accordance with the soil conditions which obtain on their respective estates.

Emphasis is laid on the necessity of the selection of all cotton seed before planting, in order that the quality of the product may be maintained. This should be conducted on the principle of rejecting all seed which is smooth (without fuzz), or immature, or aborted; that is to say, every seed that is used for planting should be fully grown, and will possess a green tuft of fuzz at one end.

Attention is drawn to the fact that the principal enemy of the cotton plant in Antigua, at the present time, is the flower-bud maggot (*Contarinia gossypii*), and that early planting has done a great deal to lessen the incidence of this pest. A possible explanation of this circumstance is provided by the consideration that the warmer weather of October favours the growth of the parasites of this insect, so that the young buds forming at that time are protected from its attacks.

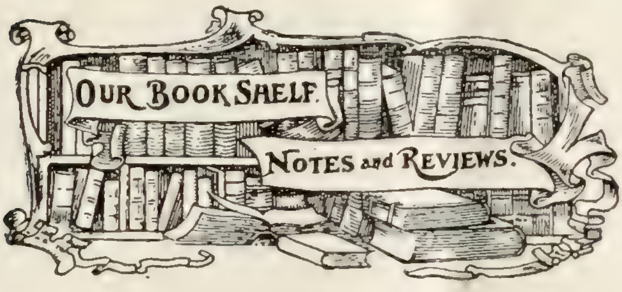
SELECTED ST. VINCENT COTTON SEED.

A notice has been issued by the St. Vincent Agricultural Department strongly urging cotton growers in that colony to plant carefully selected and disinfected cotton seed, only, in order that the good name and quality of St. Vincent cotton may be maintained.

For the purpose of facilitating the planting of such seed, the Agricultural Department has made arrangements to supply it to small growers at cost price, and to treat seed for them, if this is desired. Under this scheme, the following prices are charged: for selected, tested and disinfected cotton seed, 5c. per lb.; for selecting and disinfecting growers' own seed, 2c. per lb.; for selecting only, $\frac{3}{4}$-c. per lb.; for disinfecting only, $\frac{1}{2}$-c. per lb. If any seed thus supplied is found to be unsatisfactory, growers are requested to return it within fourteen days, for examination.

If growers in any of the other islands require selected St. Vincent seed, it will be supplied at 6c. per lb., in addition to the cost of packing and shipping.

In the event of any applications being received for such seed from foreign countries, it will probably be obtainable at a cost of 24c. per lb.



OUR INSECT FRIENDS AND ENEMIES. By John B. Smith, D.Sc. *The J. B. Lippincott Co., 1909.* \$1·50.

This is an attractive book of some 300 pages, written for the general reader and well illustrated with coloured plates and figures in the text. Although written in popular style and language, this book is of interest to the student as well as the general reader, and while it includes a statement of many facts already known, they are presented in such a way as to make them of interest, and to show them in relation to other facts in a way that might not be suspected, even by those who are familiar with them. The titles of the chapters will serve to give a good indication of the general nature of the work, and each will be briefly reviewed under its heading.

I. Insects in Their Relation to the Animal Kingdom. Under this head is discussed the position of insects in the animal kingdom. The anatomy, physiology and life-history of insects as well as a brief outline of the classification of the natural orders are also shortly dealt with.

II. Insects in Their Relation to Plants as Benefactors. Many insects are beneficial in their relation to plants, among which are to be included principally those which serve for the pollination of flowers, which are so arranged as to require such assistance in the transference of pollen from the anther to the stigma.

III. Insects in Their Relation to Plants as Destroyers. It is in this connexion that insects are generally best known, that is, as pests of plants, and especially of cultivated plants, and they are more often noticed from the great amount of damage which they are capable of doing than from any other cause. In this chapter, the principal orders of insects are considered, and their liability to occur as pests is discussed.

IV. Insects in Their Relation to Each Other. In this chapter is discussed the relation of parasitic and predaceous insects to those other forms in or on which they prey or feed. Insects are among the most prolific of all the forms of animal life, and if it were not for the natural checks which are exercised on this increase, their numbers would soon be sufficient to devour every green thing on the face of the earth. It is due to the habits which certain insects possess that this enormous increase does not occur.

V. Insects in Their Relation to the Animals that Feed on Them. In this chapter are discussed the various insect-eating animals, such as birds, toads and reptiles, and mention is also made of protective colouration and warning colouration, which are supposed to be of value to those forms possessing these features, in the matter of protection from their enemies. This is a very interesting chapter, and contains the discussion of points not usually considered in dealing with the subject. For instance, it is often taken for granted that any insect-eating bird is almost certain to be beneficial, but it is often overlooked that many of these birds do not discriminate between injurious and beneficial insects, and that many insects which are parasitized are eaten.

VI. Insects in Their Relation to Weather and Diseases that Affect Them. Very few insects are known to occur in all parts of the world. The amount of moisture, as well as of temperature, exercises great influence on deciding whether certain insects can maintain themselves and increase rapidly, some being well adapted to extremes of dryness, and others to extremes of moisture. Sudden changes of temperature and sudden changes in the moisture also affect the conditions of many insects. Numbers of them are subject to attack by fungoid and other diseases, especially in climates where there is a sufficient amount of humidity for these organisms to maintain vigorous growth. This has been taken advantage of in Florida, where fungoid diseases have been used for the control of scale insects on cultivated plants, with good effect.

VII. Insects in Their Relation to Other Animals. Many insects are parasitic upon other animals, generally as external parasites. Mosquitos, fleas, lice and bed-bugs attack man, while many others infest other animals, causing disease and financial loss, in many instances. The screw-worm, the sheep bot-fly, and many pests of poultry and other domestic animals, occur in all parts of the world.

VIII. Insects in Their Relation to Man as Benefactors. Perhaps the silk worm holds the pre-eminent position in the matter of direct benefit to mankind. The honey-bee is of nearly equal benefit, and several other insects are beneficial, on a smaller scale.

IX. Insects in Their Relation to Man as Carriers of Disease. In this chapter, insects are considered in what is perhaps the most important phase of their relationships. Mosquitos are carriers and transmitters of such diseases as malaria, filaria, and yellow fever, and other insects of the order Diptera, which are responsible for the dissemination of typhoid fever and sleeping sickness, have been responsible for enormous losses of life, and for preventing the development of many districts which are extremely suitable for agriculture, except for the abundance of these troublesome pests. As carriers of disease, insects are now known in a rôle which was almost unsuspected a generation ago.

X. Insects in Their Relation to the Household. In this chapter are considered the insects which cause damage and annoyance in the dwellings of mankind. Some of these are important because of their attack on the person, and others because of their attack on furniture, books, fabrics, food-stuffs, and even on the structure of the buildings themselves.

XI. Insects in Their Relation to the Farmer and Fruit Grower. In this chapter are considered the various pests which attack agricultural crops in a general sense. Under absolutely natural conditions, a balance is quickly established between the animal life and the vegetation. When, however, man intervenes and produces, in a given district, plants that are not indigenous to it, or any of the native plants, in numbers in excess of those in which they occur naturally, this balance is upset and insects appear as pests, in adapting themselves to the altered conditions. Any great increase of the area of certain kinds of plants has always led to the development of insect pests and diseases, which it had been necessary for the agriculturist to combat in order to produce profitable crops. To estimate the value of the losses caused by the ravages of insects is rather difficult, but an approximation may be made. It is stated at the close of this chapter, that the annual loss due to attacks of insects in the United States alone, may be estimated at \$1,500,000,000 at least.

XII. The War on Insects. The concluding chapter of the book deals with the methods employed for the control of insect pests. A brief outline is given of the different kinds of insecticides which may be used, and directions for preparing and using certain of the best of each kind. The matter of farm practice as related to the control of injurious insects is also considered

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

Agriculture and the Supply of Labour forms the subject of the editorial of the present number.

The article, on page 179, giving an account of the introductions of sugar-canes into Mauritius, at different times, presents some indications of the history of the sugar industry of that colony.

An abstract of an account of interesting work that is being done in India, in connexion with fruit-growing, appears on page 180.

A way in which the making of Bordeaux mixture may be simplified is described on page 181.

The Insect Notes of this issue, which will be found on page 186, give an account of two common hardback beetles of the West Indies.

An article dealing with the work of co-operative credit societies, in India, appears on page 187.

The last of the series of articles on The Chief Groups of Fungi, which have been appearing as Fungus Notes, is given in the form of a tabular diagram, on page 190, where its use is explained. It should be stated that the yeasts are mentioned, in this, under their generic name of Saccharomyces.

Publications of the Imperial Department of Agriculture.

Parts I and II of the *Report on Sugar-Cane Experiments in the Leeward Islands*, 1908-9, are now being issued. The conclusions in these formed the subject-matter of Pamphlets 63 and 64 of the Department Series.

Tubers of Calathea Allouya.

With reference to the article on page 152 of the current volume of the *Agricultural News*, dealing with tubers of *Calathea Allouya*, Mr. W. H. Porter, of Dominica, gives statements in support of the usefulness of these as a vegetable, and has kindly drawn attention to a passage in the *History of the Caribby Islands*, by I. Davis, published in 1666. This passage is as follows: 'The Potatoe (*sic*) is a root much like the Saligots growing in Gardens, which are called *Topinambous*, or Jerusalem Artichokes, but of a much more excellent taste, and more wholsome (*sic*). Those *Topinambous* or Artichokes, which are now not only very common, in most parts, but cheap, and slighted as being a treatment for the poorer sort, were heretofore accounted delicious. For in some extraordinary Entertainments made at *Paris* by the Princes, to entertain Embassadours (*sic*), in the Year M.DC.XVI, they were served up among the most exquisite dishes.'

According to Mr. Porter, and to Mr. Jones, Curator of the Dominica Botanic Station, the tubers are known by the name of 'topee tambou' in Dominica, as well as in Trinidad.

The Japanese Camphor Industry.

The *Board of Trade Journal* for April 7, 1910, gives an abstract of an article, published in the *Nachrichten für Handel und Industrie*, which presents particulars regarding the position of the Japanese camphor industry. According to this, the Japanese Camphor Monopoly raised the price of its camphor, between 1903 and 1907, and caused the production to increase in Formosa and Japan. In the latter year, the Japanese sales fell off to a large extent, on account of competition with artificial German camphor and Chinese camphor; this is shown by the circumstance that, while the exports of camphor from Japan (including Formosa), for 1907, were 6,919,194 lb., valued at £780,925 (taking the Kin at 1·3 lb., and the Yen at 2*s.* 0½*d.*) those of 1908 were 4,522,135 lb, valued at £385,253. The result was that the Japanese Camphor Monopoly was forced to effect a considerable reduction in the price; but, notwithstanding the fact that the sales increased so that exports during the first ten months of 1909 were 9,434,727 lb., valued at £644,375, the Monopoly has been working at a loss. About 80 per cent. of the Japanese supply of camphor is obtained from Formosa, and the cost of production of this tends to increase, so that it is expected that the Japanese Monopoly will restrict the rate at which it is produced, in order to relieve the over-stocked condition, and that it will then again raise the price of its camphor.

Rubber Trees and Green Manuring.

An article with this title appeared on page 13 of the current volume of the *Agricultural News*. Mr. R. D. Anstead, B.Sc., late Agricultural Superintendent in Grenada, under the Imperial Department of Agriculture, draws attention to this in the *Planters' Chronicle* [India] for March 19, 1910, and gives an account of an experiment, having connexion with the same subject, which was carried out by him recently in South Travancore. In this, two samples of soil were taken, one from under a very poor covering of *Passiflora* sp., and one from a patch which had been kept clean weeded, and which was exposed to the sun. Equal weights of the samples were dried in an oven for five or six hours, and the weights taken again, when it was found that, although the *Passiflora* was of poor growth and gave a minimum of shade, the soil beneath it contained 11 per cent. more moisture than that of the area which had been kept clear of weeds.

Mr. Anstead points out that this experiment is a strong argument in favour of keeping the ground covered with a growing cover crop, even during the dry season, at any rate in some kinds of cultivation, and suggests that leguminous weeds, such as *Cassia mimosoides*, may well be used in the place of plants like Passiflora. He also draws attention to the usefulness of plants grown in this way, in the prevention of the loss of surface soil by washing during heavy rains.

The Protection of Seeds from Birds.

The German Imperial Biological Institute has conducted experiments in order to find out the extent to which seeds may be protected from birds, by imparting to them an unusual colour or an objectionable taste or smell. A short account of these, given in the *Queensland Agricultural Journal*, Vol. XXIV, p. 172, shows that, as regards colour, the trials were made with a red colouring matter, Prussian blue and aniline green, the mixture for treatment being made with 0·2 parts of glue dissolved in 8 parts of water, together with 2·0 parts, 0·5 to 1·0 part, and 0·4 part of the colouring matters, respectively; this amount of the mixture was used for 100 parts of seed. It was found that the coloured dressing did not affect the germinating power of the seed, and that the blue colour was most useful in keeping the birds away from it.

In the experiments, where a dressing was used which would give the seed an unpleasant taste or smell, it was found that 0·6 part of powdered aloes, with 8 parts of water, to 100 parts of seed, and a 3-per cent. solution of creolin, in the proportion of 8 parts to 100 parts of seed, were successful in entirely protecting the latter from the attacks of birds.

The trials showed, incidentally, that the birds employed in them (rooks and crows) are influenced, when searching for food, by colour, taste and smell.

It is suggested that useful experiments on the same lines, with substances like aloes and creolin, might be tried by planters in the West Indies when plants such as maize and Guinea corn are being sown.

Sesbania Aculeata as a Green Manure.

Reference has been made already to the use of *Sesbania aculeata* as a green manure in India, where it is known as 'dhaincha' (*Agricultural News*, Vol. VIII, p. 271; Vol. IX, p. 124). In the *Quarterly Journal* of the Department of Agriculture, Bengal, January 1910, the suitability of this plant for green manuring is emphasized, and it is compared, in this connexion, with *Phaseolus aconitifolius*. It is stated that the plant grows well on poor soil. In an experiment, ground was prepared for sowing, by means of a hoe, and the seed was sown broadcast among tea plants; in five weeks time the seedlings had grown to a height of 1 foot, and were ready to be hoed into the soil. Seed for a new crop is easily obtained, as the plant forms this in a most prolific way.

Calcium Cyanamide and Nitrate of Lime.

It is of interest that the results of experiments with calcium cyanamide and nitrate of lime, recently conducted at Rothamsted, which were noted shortly on page 169 of the last number of the *Agricultural News*, are paralleled exactly by the conclusions that have had to be drawn from similar trials lately made at the Agricultural College, Turin, Italy, a note on which appears in the *Experiment Station Record*, Vol. XXII, p. 431. In these, it was found, similarly, that both calcium cyanamide and nitrate of lime have a manurial value equal to that of sulphate of ammonia and nitrate of soda, and the additional interesting observation was made that granular calcium cyanamide is more convenient to handle than nitrate of soda.

The Renard Road Train.

The *Colonial Office Journal* for April 1910 gives an account of a report made of official trials with the Renard road train, conducted in India. This shows that the driving of the train is a simple matter, and that the system of steering ensures that the trailing cars follow accurately the track of the locomotor and of those in front, so that the train runs perfectly safely round corners and through congested traffic. An efficient system of brakes is provided, by means of which a train running at a speed of 12 miles an hour may be brought to a stop within a length of 12 feet, without inconvenient shock.

A trial was made with a train, loaded with over 14 tons, in which gradients of one in eighteen to one in twenty-five, and even one in twelve, were successfully ascended. In one instance the train was stopped, and started without difficulty, on a gradient of one in eleven, on a curve of 12 feet radius. Assistance is given in work of this kind by the fact that the train can be run at eight different speeds.

Trials have shown that little damage is done to the road surface, whether the train is running light, or is heavily loaded, and the results demonstrate generally, that such trains are suited to the conditions which obtain on roads through the larger part of India.

INSECT NOTES.

THE HARDBACK BEETLES.

There has been reported recently in Barbados the occurrence in unusual numbers of a beetle similar to the ordinary hardback (*Ligyrus tumulosus*). For the purposes of distinguishing between these two insects in this short article, it might be well to designate the commoner form as the black hardback, and the one at present under discussion as the brown hardback. The black hardback is of fairly common occurrence and has been mentioned briefly in recent numbers of the *Agricultural News* (see Vol. IX, pp. 58 and 106). It is frequently to be seen flying to lights at night, when it makes itself conspicuous by its humming and buzzing and knocking against ceilings and walls. The larva, or grub, of this insect lives underground and feeds mostly on decaying vegetable matter, although it may sometimes eat the small roots of growing plants. This grub has sometimes been confused, in the minds of planters and others, with that of the root borer. The difference between these two has been explained in the articles mentioned. It may be well to state, however, that the root borer grub has no legs, and is generally, if not always, to be found inside the underground portions of the stool of cane; whereas the grub of the hardback has three pairs of thin legs, and is always to be found in the soil, among the roots of plants, or anywhere where there is an abundance of trash or other organic matter.

It is not supposed that the black hardback is responsible for any serious damage to growing plants, either in the larval or the adult stage. As has been already stated, the larva is chiefly a scavenger, living on decaying matter, and the adult does not appear to feed to any great extent.

The brown hardback, which has been identified as *Cyclocephala* sp., is generally less abundant than the black one. During the month of May, in this year, however, this insect has been reported to occur in large numbers in two restricted localities in Barbados, as many as 500 to 600 adult beetles having been captured in a single night in each of these places. Most people in Barbados, and probably in the other West Indian Islands, are familiar with the appearance of this brown hardback, but very few have perhaps ever seen more than two or three at a time. They are attracted, to a small extent at least, to lights, and many people who have seen them in their houses have regarded them merely as the young or immature form of the black hardback. This is, of course, not the case, as the young form of a beetle is a grub, and when the insect has left the grub stage, passed through the pupal stage and emerged as a winged insect, it is adult and of full size, and there is very little difference in appearance between the individuals of the same species.

The larva of the brown hardback is not known, and it may be possible that it is so nearly like the grub of the black one that the two kinds have not been separated, and on the other hand, it may be that it occurs in different situations and under different conditions. It is certain that the larva of the brown hardback would be found to be an underground grub, and it may have a habit similar to that of the black hardback; it may be entirely injurious through feeding on the roots of living plants and not on decaying vegetable matter. The roots of roses and other garden plants are sometimes attacked by grubs in the soil, and these are called hardback grubs, but it may be that investigation will show that this is the work of the brown bardback and not of the ordinary black one.

The attacks of the brown hardback have all been made at night, and a careful inspection at any time during the day does not reveal the presence of these insects, unless the ground at the base of the plants is carefully searched, also. These beetles come out in the evening, as it gets dark; but as daylight approaches, burrow into the soil to a depth of 3 or 4 inches, where they remain in hiding. This habit of hiding in the soil during the day is common also to the black hardback. The brown hardback attacks a great variety of plants, the rose and hibiscus seeming to be principal favourites, and certain kinds of roses seem to be preferred to others, notably, La France and Maréchal Niel. A visit to these attacked areas with a light at night reveals the beetles busily engaged in feeding on the leaves. The mating of the sexes also occurs at this time and place. The beetles are easily disturbed and if the plant, or the branch on which they are clinging, is shaken or jarred, they loosen their hold and drop.

The remedies proposed for the control of these insects are of three kinds:—

(1) The use of Paris green, in the manner in which it is employed in the cotton industry, on the leaves of the plants attacked.

(2) The use of a light-trap, consisting of a lantern standing or suspended over a tray of water to which a small amount of kerosene has been added. Any beetles attracted to the light will fly against the glass and drop into the water below, where the kerosene will kill them. This recommendation is only tentative, because it is not known how great an attraction the light may have for this insect.

(3) Collecting. Where these insects occur in large numbers they might be easily shaken, or jarred, off the plant into a bucket containing water and kerosene.

It is not known what natural enemies these beetles may have, but it is expected that the common toad would be very useful in this connexion, for while this animal has not been seen feeding on these hardbacks, excremental matter has been found consisting largely of undigested portions of the brown variety, and it is thought that this shows the work of toads. At the present time there is no record of injury to crops or plants of economic importance, but it can be easily understood that insects which are capable of developing in such numbers as to make it possible to collect 500 or 600 in a single night in a corner of a small garden, might become an extremely serious pest if they should ever occur in proportionate numbers over large areas. Many of the plants on which these insects feed are entirely denuded of leaves. This is especially true of certain roses, and the leaves of other plants have been eaten to a very considerable extent.

The Agricultural Experiment Station of the University of Illinois published a bulletin (No. 116) in 1907, dealing with the white grubs and May beetles which occur in that State. Twelve species of these insects are found there, nine of which are considered to be injurious, and three are harmless. One of the injurious species belongs to the same genus as the brown hardback now under discussion—*Cyclocephala*. Two of the harmless forms known in Illinois belong to the genus *Ligyrus*, and are therefore related more nearly to our black hardback (*Ligyrus tumulosus*). This bulletin gives many interesting notes on the life-history of the injurious beetles and white grubs, all of which belong to the genus *Lachnosterna* and, it is stated, require about three years for the completion of their life-cycle, the greater part of which is occupied in the larval stage. The pupal and adult periods, up to the time of egg-laying, probably do not last more than two or three months. The length of the life-cycle of the *Cyclocephala* is not given, but it may be assumed to be about the same as that of the species of

Lachnosterna. It should be stated, however, that where insects belonging to the same group as the hardbacks are known as pests, it is usually the larva that causes the damage and not the adult, the abundance of the adult generally being significant of large numbers of the grubs rather than the actual cause of serious injury to cultivated crops. As the grubs of these beetles live underground, they are capable of doing great damage before their presence is detected, and this is especially true when they feed entirely on the roots of cultivated plants.

CO-OPERATIVE CREDIT SOCIETIES IN INDIA.

Attention has been drawn by the author, Mr. C. S. R. Rao, to an article in the *Hindustan Review* for November 1909, which deals with the present position of co-operative credit societies in India. In this, the objects with which the Government of India began the experiments of co-operative credit are stated first; they are: (1) to provide cheap capital to the agriculturist, (2) to release him from his dependence on the money lender. For these purposes the Co-operative Credit Societies Act was passed in March 1904, and although little impression has been made on the great burden of agricultural indebtedness in India, which has been estimated to be over 500 million pounds sterling, marked progress has been made in the experimental stage. Three kinds of societies are registered under the Act: (1) Central Societies lending to other Societies, (2) Urban Societies, (3) Rural Societies. On July 1, 1907, the total working capital of these was £158,112; at the same date in 1908, it was £293,802. The scheme has not been followed in the same way in all parts of India, and the article gives an account of it in its different modes of application.

It is shown that future progress depends entirely on the removal of certain disabilities, which are, broadly speaking, legal, financial and educational. In connexion with the legal difficulties, a sub-committee was appointed at the last Conference of Registrars of Co-operative Credit Societies, held at Simla, for the purpose of dealing with suggested amendments to the Act. A similar sub-committee, convened to deal with financial difficulties, came to the conclusion that too great dependence by the societies on the Government should not exist, and passed resolutions in connexion with the matter to the effect that Government assistance is justifiable and desirable in the early stages of the movement and that the Government should aid in the matters of audit and inspection until such time as the societies themselves could provide these.

The most important subject which engaged the attention of the Conference was that of the establishment of Agricultural Banks for the purpose of helping Co-operative Credit Societies, and of advancing loans directly to agriculturists, at reasonable rates of interest. The ways in which the place of such agricultural banks is filled at the present time are described, and it is pointed out that, as the essential principle of co-operative credit is mutual self-help, it will only confound the issues if the subject of agricultural relief is confused with the work of co-operative credit societies.

In relation to the educational difficulty, that is to the dissemination of information relating to the principles of co-operation, it is shown that this is met in some parts of India by efforts to interest the teaching staff, and through this the students, of various educational institutions. In others, notes on co-operative credit societies have been published from time to time in the press. Lastly, the Madras Government has sanctioned the publication of a quarterly bulletin which fulfils the object of assisting co-operative credit societies and of providing information for the use of societies and persons interested in the movement.

SOME EFFECTS OF MANURES ON THE SOIL.

A paper entitled *Some Secondary Actions of Manures on the Soil,* by A. D. Hall, M.A., F.R.S., appears in the *Journal of the Royal Horticultural Society of England,* Vol. LXX, p. 12. The following interesting summary is taken from this:—

(1) The long-continued use of sulphate of ammonia on soils poor in lime results in the soils becoming acid.

(2) The acidity is caused by certain micro-fungi in the soil, which split up the sulphate of ammonia in order to obtain the ammonia, and thereby set free sulphuric acid.

(3) The infertility of such soils is due to the way all the regular bacterial changes in the soil are suspended by the acidity; instead, fungi permeate the soil and seize upon the manure.

(4) The remedy, as may be seen upon the Woburn plots, is the use of sufficient lime to keep the soil neutral.

(5) From the Rothamsted soils, carbonate of lime is being washed out at the rate of 800 to 1,000 lb. per acre per annum, the losses being increased by the use of sulphate of ammonia, but lessened by dung or nitrate of soda.

(6) Nitrate of soda, when applied to heavy soils in large quantities, destroys their texture.

(7) Some of the nitrate of soda gets converted into carbonate of soda by the action of plants and bacteria; and carbonate of soda, by deflocculating the clay particles, destroys the tilth.

(8) The best remedies are the use of soot or superphosphate; the best preventive is the use of a mixture of nitrate of soda and sulphate of ammonia, instead of either separately.

(9) Soluble potash manures and common salt may also injure the tilth of heavy soils through the production of a little soluble alkali by interaction with carbonate of lime in the soil. The remedy is to apply such manures in the winter, or in conjunction with superphosphate.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated May 27, 1910, gives information as follows:—

The weather during the early part of the fortnight has been showery, but the last few days have been very hot.

Very little paddy now remains in growers' hands, and most mills have shut down.

Local demand is brisk, and the price is steadily advancing; and we look for still higher prices shortly. Export to West Indian Islands during the fortnight amounted to 1,240 bags.

We quote to-day, for good quality Demerara brown rice:—

Nominally, 19*s.* 9*d.* to 20*s.* 9*d.* per bag of 180 lb. gross.
17*s.* to 18*s.* „ „ „ 164 lb. „

GLEANINGS.

The last sugar crop in Natal was the largest which has yet been known, and amounted to 63,000 tons. It is estimated that the output for the coming crop will be nearly 75,000 tons.

The *Chemical Trade Journal*, Vol. 45, pp. 354 and 364, contains a brief note of a method, known as Serpek's process, for manufacturing aluminium nitride, employing nitrogen of the air, and using this compound as a manure.

A report by the British Vice-Consul at Puerto Plata shows that 13,959,017 ℔. of cacao was exported during the year 1909. This is a record quantity, and is probably accounted for by an increase in the area of cultivation.

The total amount of cotton imported into the United Kingdom during the quarter ended March 31, 1910, was 744,060 bales. Of this quantity, 2,768 bales were shipped from the British West Indies. (The *Board of Trade Journal*, April 7, 1910.)

The *Journal of Hygiene*, Vol. IX, No. 2, contains a paper by W.P. Kaufmann, M.D., in which it is held that persons employed in starch factories, under conditions which lead to the inhalation of the starch dust, show a comparative immunity from respiratory disorders.

H.M. Consul at Newchwang reports that the quantity of soy bean cake exported from Manchuria during 1909 was 594,000 tons, of which about 90 per cent. went to Japan, and most of the rest to South China, in which places it is used as a manure for rice and sugar-cane, respectively. Several shipments to Europe were a failure, giving rise to the general opinion that it is impossible for soy bean cake to travel through the tropics to Europe in good condition.

In a paper which appears in the *Comptes Rendus de l'Académie des Sciences*, Paris, it is claimed to have been demonstrated that the fæces from animals suspected to be ill with anthrax, and the fæcal matter of those that have died from the disease, will indicate these facts at once by bacterial examination. The conditions in the intestines favour spore formation, in which stage the bacillus is resistant to putrefaction, and anthrax cultures can always be obtained by heating the fæcal matter to 65°C. Under these conditions, the colonies of the bacillus are the more numerous the later the examination is made. (The *Louisiana Planter and Sugar Manufacturer*, March 26, 1910.)

Information has been received from the Pennsylvania State College that the National Dairy Show of the United States introduced a new class into its prize list, in 1909, which includes cows of any age having official yearly milk records. The purpose of this was to give the milking capacity of cows reasonable acknowledgement when being judged in the ring, and experience at the show has proved that the adoption of the scheme is justified.

The eighteenth *Annual Report* (1908-9) of the Oklahoma Agricultural Experiment Station gives the following information in connexion with broom corn. The market demands a brush of fresh green colour, so that the heads should be free from stains, and therefore it should be harvested when the plants are coming into full bloom. If the crop is allowed to remain after this, and the weather is wet, the heads which remain inside the leaf sheath will have a tendency to turn red. Similar damage may be done through attacks of plant lice, and through over-ripeness and exposure to the sun.

Experiments that have been performed at the Upper Shillong [India] Agricultural Station, for the purpose of comparing the yields of potatos planted with whole and cut sets, are described in the *Annual Report of the Agricultural Stations in Eastern Bengal and Assam*, 1908-9. Two sets of trials, conducted in 1907-8 and 1908-9, have shown that the yield obtained from cut sets was practically equal to that from whole sets. It is concluded from these results, that when there is a shortage of sets, large tubers may be cut to form two or more sets, without any danger of diminution in the crop.

In *Nature* for May 5, 1910, p. 289, an abstract of a paper which appeared in the March number of *Terrestrial Magnetism and Atmospheric Electricity* is given. In this it is shown that the magnetic storm which accompanied the eruption of Mont Pelée on May 18, 1902, was not instantaneous over the whole earth, but that it originated about 14° west of Mont Pelée and travelled eastward, with a velocity of about 7,000 miles per minute, round the entire globe. This discovery has led to the examination of other records, with the result that it is now concluded that such storms are not instantaneous over the whole earth, but generally travel eastward, with a speed of about 7,000 miles per minute.

A booklet entitled *Insurance against Gales, Cyclones and Earthquakes*, which has been issued recently for Messrs. Henry Head & Co., Ltd., 27, Cornhill, London, E.C., shows that where contracts have been entered into between growers of canes and sugar factories, the risk of the factory being unable to take the cane, owing to any defined cause, can be covered; in the event of a claim, underwriters are liable for the additional costs for having the canes ground elsewhere; or if a breakdown occurs at a time when it is impossible for this to be done, they are prepared to pay a total loss on the acreage which cannot be reaped in consequence of the breakdown of the factory. The booklet contains many other interesting particulars concerning insurance, that in the West Indies being specially considered.

STUDENTS' CORNER.

JUNE.

SECOND PERIOD.

Seasonal Notes.

By this time, the brokers' reports on the shipments of cotton from the last crop will have been received. Careful note of these should be made, and the opinions given concerning the cotton should be compared with the observations made on the estate earlier in the season. Useful information should be obtained by endeavouring to ascertain why that shipped under certain marks has obtained higher prices than other lots, under similar market conditions. What are the chief characters of a good type of Sea Island cotton, and on what circumstances in its production do these depend chiefly? Explain what is meant by : nep, wasty cotton, stained cotton, and state on what the presence of these in a sample depends.

Where opportunities for this are given, visits should be made to places where large quantities of cotton seed are handled, in order that information in connexion with selection, testing and disinfection may be obtained. How would you conduct a fair test of the germinating power of seed that had been kept in heaps on the floor of a store-room? In what way is harm likely to occur to seed that has been stored in this manner?

The preparation of land for cotton planting should have been completed by this time, and the student will be in possession of notes as to the kind of tillage which the land has received. He will also have made observations on the manner in which different manures are applied, and the way in which the plants that were grown for the purpose of providing green dressings are employed. (See *Agricultural News*, Vols. IV, p. 182 and IX, p. 86; also Pamphlet No. 45 of the Department Series—*A B C of Cotton Planting*, enlarged edition.)

As dry weather is preferred for the distillation of bay oil, this will most probably have been completed, in those islands where it is conducted. Examine the kind of still that is used for the purpose, and make notes of any improvements in the process that may suggest themselves to you. What other plant do you know of, closely related to the bay tree, which yields a crop that is of commercial importance? Make a list of as many plants as you can, that bear leaves from which useful products are obtained by distillation. In what ways are such products generally employed? Name any special uses that some of them possess. From what other parts of plants, besides the leaves, may oils of a nature similar to that of bay oil be obtained?

Estates on which cacao, coffee, rubber, nutmegs, limes and similar plants are raised, usually possess a nursery for the provision of seedlings of such plants as may be required for establishment in the coming growing season. For such a nursery, a good supply of bamboo pots and ordinary, earthenware pots, as well as seed boxes will have been prepared, in order that the seeds of the plants that it is intended to raise may be sown as soon as the rains begin. Other nursery work will consist in seeing that the beds are well forked, manured and prepared for the reception of the seedlings that will have to be transplanted into them. All pots and boxes should be carefully cleaned, and the manure used in the beds should be well rotted. Why is it necessary for these precautions to be taken? When the seedlings are growing, a close watch should be kept for any signs of disease or pests; in the event of the appearance of these, if they cannot be controlled by spraying or other suitable treatment, it is best to destroy the affected seedlings, preferably by burning.

Nurseries should not be kept merely on those estates where they are required primarily to provide seedlings for the establishment of plants of the kind that it is the chief work of the estate to produce. They have their place on all estates, even where little besides sugar or cotton is grown, though they will not be conducted on the same scale, on such estates, as on properties where crops like cacao are grown chiefly. The main purpose of such small nurseries will be to afford a means of propagating useful plants, such as forest and shade trees. It may not be that these will help directly to increase the revenue from the estate in any way, but they will have their use in improving the general conditions that obtain on it, especially on those parts which are employed for pasturing stock. Every practical agriculturist should keep a constant watch for the purpose of discovering trees of any kind, in his neighbourhood, that may be of use to him; he should also be on the alert for any that he may be made cognizant of, either in his reading, or in conversation with others. If he is in possession of a well-kept nursery, he will be able to take advantage of what he has discovered, or learnt, to the betterment of the conditions of his everyday surroundings.

Reference was made to the subject of mulching cacao, in this column, on page 157 of this volume of the *Agricultural News*. Note that, where special manures are used for cacao, these are applied at the time of the first rains. Why is this? What soil constituents are most quickly exhausted by plants which are grown chiefly for their fruits and seeds? What are the main differences between the effect on the soil of growing a crop like cacao and that of raising crops such as sugar-cane, cotton and ground provisions?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why do clay soils require more tillage than sandy soils?

(2) What are contour drains, and where are they used especially?

(3) State what is meant by an incomplete manure.

INTERMEDIATE QUESTIONS.

(1) What is understood by root disease of the sugar-cane? How does this disease affect the plant, and how is it spread?

(2) Why is sulphate of ammonia used as a manure for the sugar-cane? In what forms may the nitrogen that it contains be taken in by the plant?

(3) Give a list of the most troublesome weeds in your neighbourhood, and state what you consider to be the best ways of getting rid of them.

Information has been received that the first number of a new paper, chiefly devoted to sugar interests, hast just been issued, under the title of 'The Modern Sugar Planter'. The founder and publisher of this new weekly paper is A. B. Gilmore, 512, Camp Street, New Orleans, La., who has been manager and editor of the *Sugar Planters' Journal* for the past ten years, and whose experience should go far to ensure its usefulness. A review of the journal will be given in the next number of the *Agricultural News*.

FUNGUS NOTES.

THE CHIEF GROUPS OF FUNGI.

PART VIII.

The following tabular diagram contains a summary of the fungi that have been dealt with in Parts I to VII of this series of articles. It is intended to serve as an assistance to the memory, and as a partial index to the contents of those articles:—

PHYCOMYCETES.	Oomycetes	Chytridineae		*Olpidium brassicae*, p. 94.
		Peronosporineae		*Phytophthora omnivora*, p. 110. *Plasmopora viticola*, p. 110. *Pythium de Baryanum*, p. 110.
	Zygomycetes	Mucorineae		*Mucor* sp., p. 111.
		Entomophthorineae		*Empusa* spp., p. 111. *Entomophthora* spp., p. 111.
ASCOMYCETES.		Protoascineae		*Saccharomyces* spp., p. 126.
		Protodiscineae		*Exoascus* spp., p. 126. *Taphrina* spp., p. 126.
		Helvellineae		*Morchella* spp., p. 126.
		Discomycetes		*Sclerotinia fuckeliana*, p. 126.
		Tuberineae		
		Plectascineae		*Meliola* spp., p. 127. *Myriangium Duriaei*, p. 127.
		Pyrenomycetes	Hypocreales	*Cordyceps* spp. „ p. 175. *Nectria* spp. „ p. 127. *Ophionectria coccicola*, p. 127. *Sphaerostilbe coccophila*, p. 127. *Sphaerostilbe flavidum*, p. 127.
			Sphaeriales	*Trichosphaeria sacchari*, p. 127.
			Dothidiales	
BASIDIOMYCETES.		Ustilagineae		*Ustilago Maydis*, p. 142.
			Uredinales	*Uredo gossypii*, p. 142. „ *arachidis*, p. 142. „ *cannae*, p. 142. *Puccinia graminis*, p. 158.
	Hymenomycetes		Agaricaceae	*Marasmius sacchari*, p. 159. „ *semiustus*, p. 159. *Schizophyllum commune*, p. 159.
			Polyporaceae	*Polyporus* spp., p. 159.
			Hydnaceae	*Hydnum* spp., p. 159.
			Thelephoraceae	*Corticium lilaco-fuscum*, p. 159.
	Gasteromycetes		Phalloidaceae	*Phallus gracilis*, p. 159. *Clathrus trilobatus*, p. 159.
			Lycoperdaceae	
FUNGI IMPERFECTI.		Sphaeropsidales	Sphaerioidaceae	*Diplodia cacaoicola*, p. 174. *Botryodiplodia* sp., p. 174.
			Nectrioidaceae	*Aschersonia* spp., p. 174.
		Melanconiales	Melanconiaceae	*Colletotrichum falcatum*, p. 174. „ *gossypii*, p. 174. „ *luxificum*, p. 174. *Gloeosporium musarum*, p. 174. *Pestalozzia palmarum*, p. 174.
		Hyphomycetales	Mucedinaceae	*Ramularia areola*, p. 175.
			Dematiaceae	*Cladosporium elegans*, p. 175. *Cercospora gossypina*, p. 175. *Thielaviopsis ethaceticus*, p. 175.
			Stilbaceae	*Stilbella flavida*, p. 175.
			Tuberculariaceae	*Fusarium lycopersici*, p. 175. *Microcera coccophila*, p. 175.

TAPPING THE TALIPOT PALM.

On the completion of the period of its vegetative growth, the Talipot palm (*Corypha umbraculifera*) sends up, at the top of the stem, a single spadix of enormous size. Unlike the development of the generality of other palm spadices, that of the Talipot is remarkably slow. It is said to attain to a height of 6 feet and a basal girth of from 2 to 3 feet, in not less than two months from the date of its emergence. At the end of this period, and before the spathe bursts, the tapper ascends the gigantic stem by means of light ladders constructed of bamboo. At the top and over the bases of the leaf stalks, the tapper constructs a platform of bamboo work immediately around the base of the spadix. This done, he straightway proceeds to cut away the whole of the spathe investing the spadix. The latter is now bound round, at intervals, with long strands of rattan or other stout fibre, from its base to a height reaching up to his head. The intervals between the ties vary much, but are not usually greater than 6 or 8 inches. The ties are further tightened by ramming, like wedges, short lengths of round stick between them and the spadix. Care is taken, however, to see that the skin of the smooth tender spadix is not broken, or bruised. The top of the spadix is then cut with a 'dah' (a very sharp, light, thin-bladed knife)—the cut surface being shaped in the form of a V.

The major portion of the toddy of the Talipot is used in the manufacture of 'jaggery', or 'gur'. (From the *Indian Agriculturist*, Vol. XXXV, No. 1.)

WEST INDIAN PRODUCTS

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of April :—

The markets during the month of April have been carried on under quite normal conditions, with regard to supply and demand. The only products that have attracted special notice have been buchu leaves, and many of the fixed oils, such as castor, cocoa-nut, etc. At the end of the month, as much as 3*s.* per lb. was quoted as the normal price for good, round, green buchu. As an 'outside' article, rubber still maintains a large share of attention, a sudden cessation of buyers being followed by moderate sales at somewhat lower rates. In West Indian products the following are the details :—

GINGER.

At the first spice auction on the 6th of the month the offerings were numerous, but there was no demand. Jamaica was represented by 334 packages, which were bought in at 53*s.* to 56*s.* per cwt. for common; some 830 packages of Cochin and Calicut were also held at 50*s.* to 53*s.* for good to fine washed. Fair limed Japan and rough brown African were also offered, and bought in at 45*s.* A fortnight later, 90 bags of good, ordinary Jamaica were sold at 54*s.* per cwt.: 715 bags of Cochin were also offered, 82 of which were disposed of without reserve; for small, washed rough, 50*s.* to 52*s.* was the reserved price for good, at which rate it was bought in; bold Calicut of varying qualities was bought in at prices from 47*s.* 6*d.* to 90*s.* Some 44 bags of small limed Japan sold at 43*s.*, and part wormy at 38*s.* per cwt. At the last auction on the 27th, prices had generally declined, together with the demand. Cochin and Calicut were represented by the large number of 1,050 packages, out of which only 170 sold, at a decline of 6*d.* to 1*s.* per cwt. Dullish washed Cochin fetched 45*s.* 6d., and brown tips 45*s.*; 55*s.* and 95*s.* were the prices at which bold, rough Calicut and selected Calicut were bought in. Of 431 bags of Japan offered, the bulk was disposed of without reserve, at from 36*s.* 6*d.* to 40*s.* and 6*d.* for limed and mouldy. African met with no buyers, and the offerings were bought in at from 45*s.* to 46*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

At the second spice auction on the 13th, 192 packages of West Indian nutmegs were brought forward and disposed of at rates of 1*s.* 2*d.* per lb. advance on previous prices for large size, and 1*s.* 4*d.* on the smaller. Throughout the remainder of the month there was but very little change. On the 27th, West Indian were represented at the auction by 100 packages, most of which sold at somewhat easier rates. Of mace there was a steady demand in the earlier part of the month; on the 13th, 46 packages of West Indian were offered and disposed of at the following rates: fair palish 1*s.* 9*d.* to 1*s.* 10*d.*, pale and reddish 1*s.* 7*d.* to 1*s.* 8*d.*, dark red 1*s.* 6*d.* to 1*s.* 8*d.*, and broken 1*s.* 5*d.* per lb. A week later the offerings were exclusively from Penang and Bombay; the former was represented by 15 cases, all of which were bought in at 1*s.* 8*d.* to 1*s.* 9*d.* for dull reddish to fair red. The Bombay consignment consisted of, 27 cases of wild mace, which found no purchasers. Pimento was in steady demand through the month. At the first spice auction on the 6th, of 96 bags offered 50 were sold at 2½*d.* for fair. A week later, some sales were effected of a few bags, out of 64 offered, at 2⅛*d.* per lb., which price was maintained till the close of the month.

ARROWROOT.

This article continues to command a very low figure and small demand. Some 99 barrels St. Vincent were brought forward at the first spice auction on the 6th of the month; 65 barrels only were sold at 1⅞*d.* per lb. for fair manufacturing.

SARSAPARILLA.

At the first drug sale on the 7th, Sarsaparilla was represented by 25 bales of Grey Jamaica, 28 bales of Lima Jamaica twenty-four of native Jamaica, eight of Honduras and seven of Mexican. The whole of the Grey Jamaica was sold, fair grey fetching 1*s.* 2*d.* to 1*s.* 3*d.* per lb. and coarse 1*s.* 1*d.* The twenty-eight bales of Lima-Jamaica were all bought in, bids of 10½*d.* being refused. Two bales of the twenty-four native Jamaica realized 10*d.* per lb., the remainder being bought in. Honduras and Mexican met with no buyers, the reserved price for the latter being 5*d.* per lb. At the auction a fortnight later, namely on the 21st, fourteen bales of Grey Jamaica were offered and 12 sold, 1*s.* 1*d.* to 1*s.* 2*d.* being paid for slightly coarse. For eight bales of dull mixed native Jamaica 2*d.* per lb. was paid, dull fair red fetching 10*d.* to 11*d.*

TAMARINDS AND LIME JUICE.

At auction on the 6th, four barrels of ordinary dry West Indian Tamarinds were disposed of at 10*s.* per cwt. On the 20th, fifty packages of fair, but dry West Indian, were brought forward, and disposed of at from 10*s.* 3*d.* to 10*s.* 9*d.* per cwt. At the auction on the 27th, concentrated West Indian lime juice was quoted at £18 15*s.* The quotations for fair to good West Indian raw lime juice was 1*s.* to 1*s.* 1*d.* per gallon. At this sale it was stated that eleven casks of citrate of lime had arrived from Demerara.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, May 24, 1910; Messrs. E. A. DE PASS & Co., May 13, 1910.

ARROWROOT—St. Vincent, 1¾d. to 3¾d.
BALATA—Sheet, 4/8; block, 3/10 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 55/6 to 60/- per cwt.; Grenada, no quotations, Jamaica, 47/- to 52/6.
COFFEE—Jamaica, 40/6 to 62/6.
COPRA—West Indian, £28 to £28 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16d. to 22d.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
HONEY—26/- to 33/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11d. to 1/1; concentrated, £18 10s. to £18 15s.; Otto of limes (hand pressed), 5/6 to 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady, West Indian, 1/7 to 1/11.
NUTMEGS—Steady.
PIMENTO—Common, 2½d.; fair, 2⅜d.; good, 2¾d. per lb.
RUBBER—Para, fine hard, 10/5, fine soft, 10/3; fine Peru, 10/3 per lb.
RUM—Jamaica, 2/- to 5/-.
SUGAR—Crystals, 18/- to 18/9; Muscovado, 14/- to 15/; Syrup, 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., May 13, 1910.

CACAO—Caracas, 13c. to 13¾c.; Grenada, 11c. to 11¼c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $25·00 to $26·00; culls, $15·00; Trinidad, select, $25·00 to $26·00; culls, $15·00 per M.
COFFEE—Jamaica, ordinary, 9c. to 9¼c.; good ordinary, 9½c. to 10c.; and washed, up to 11c. per lb.
GINGER—9½c. to 10c. per lb.
GOAT SKINS—Jamaica, 54c.; Barbados, 47c. to 50c.; St. Thomas, St. Croix, St. Kitts, 45c. to 46c. per lb.; Antigua, 47c. to 50c., dry flint.
GRAPE FRUIT—$2·50 to $3·50 per box.
LIMES—$7·00 to $7·50.
MACE—30c. to 35c. per lb.
NUTMEGS—110's, 8¾c. per lb.
ORANGES—Jamaica, $1·50 to $2·00.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 4·30c. per lb.; Muscovados, 89°, 3·80c.; Molasses, 89°, 3·55c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., May 28, 1910.

CACAO—Venezuelan, $11·25 per fanega; Trinidad, $10·80 to $11·15.
COCOA-NUT OIL—$1·09 per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$4·50 to $4·60 per 2-bushel bag.
ONIONS—$2·20 to $2·40 per 100 lb.
PEAS, SPLIT—$6·10 to $6·20 per bag.
POTATOS—English, $1·70 to $1·80 per 100 lb.
RICE—Yellow, $4·35 to $4·40; White, $4·90 to $5·00 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., June 4, 1910; Messrs. T. S. GARRAWAY & Co., June 7, 1910; Messrs. JAMES A. LYNCH & Co., May 30, 1910.

ARROWROOT—St. Vincent, $3·40 to $3·75 per 100 lb.
CACAO—$11·50 to $12·00 per 100 lb.
COCOA-NUTS—$18·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
HAY—$1·20 to $1·60 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$1·00 to $3·50 per 100 lb.
PEAS, SPLIT—$6·00 to $6·25 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $1·00 to $1·68 per 160 lb.
RICE—Ballam, $4·33 to $4·90 (180 lb.); Patna, $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, May 28, 1910; Messrs. SANDBACH, PARKER & Co., May 27, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·00 per 200 lb.	$8·00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	84c.	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$12 to $16 per M.	$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$4·00 to $4·10 per bag of 168 lb.	$4·10 per bag of 168 lb.
Green Dhal	$5·75	——
EDDOS—	60c. to 80c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	3c. to 3¼c.	3½c.
Madeira	——	No quotation
PEAS—Split	$6·00 per bag (210 lb.)	$6·10 per bag (210 lb.)
Marseilles	$4·00	No quotation
PLANTAINS—	12c. to 36c. per bunch	——
POTATOS—Nova Scotia	$1·75 to $2·00	$1·75 to $2·00
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	$1·44 per bag	——
RICE—Ballam	No quotation	$4·75
Creole	$4·25 to $4·50	$4·25 to $4·50
TANNIAS—	$1·56 per bag	——
YAMS—White	$2·40	——
Buck	$2·40 per bag	——
SUGAR—Dark crystals	$3·05 to $3·10	None
Yellow	$3·70 to $3·80	$3·70
White	$4·00	$3·80 to $4·00
Molasses	$2·25 to $2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

Changes in the Soil and its Fertility.

THE attention of agriculturists is being drawn continually to the fact that the soil is in a state of constant change. Formerly, the ideas concerning this change were restricted to the more obvious sources of loss or gain in available plant food, and these were attributed to purely physical or chemical causes, brought about by natural means alone. This is no longer the case. Full recognition is being attained of the great importance and extent of the action of living organisms in the soil, and there is no longer the general opinion that the operation of manuring the soil results simply in the addition of plant food in a more or less available condition. The consequence of these matters seems to justify their review in the form of a summary.

The conditions which surround any given portion of soil will, first of all, determine if it is to continue to exist as such. Where the 'wash' from rain-storms, especially on hillsides, will probably be great, the loss is lessened by the construction of contour drains. Plants possessing strong, binding roots are also used for the same purpose, and have been found especially useful where the soil is likely to be blown away by wind. The conservation of the soil by means of plants has, however, a far wider importance than this. It is a subject which requires due recognition when the reafforestation of a district or country is being considered. It was the want of knowledge of this that led to the destruction of forests that has taken place in some parts of the world, in the past, and which has caused all the evils that have arisen from such destruction.

The importance of the changes in the water content of the soil is evident. These are likely to be of greater proportionate magnitude than any of the others, and are of especial consequence to the agriculturist because of the necessity of water to the plant. It suffices to draw attention to the progress that has been made in the development of tillage methods that are designed to conserve the water that the soil contains, for the uses of plants—methods that have turned semi-arid regions into districts of large agricultural usefulness.

Next to water, the most potent factor in influencing

soil fertility is the content of nitrogen. This fact is well brought out in a recent paper* by A. D. Hall, M.A., F.R.S., Director of the Rothamsted Experiment Station, which, although it deals with conditions in a country situated in temperate latitudes, is worthy of special attention. Here, it is pointed out that the changes in the amount of nitrogen in the soil are brought about as follows: by the removal of crops; by the action of certain bacteria, which break down organic matter and liberate nitrogen in the free state; by the removal of nitrogen in drainage waters, as nitrates which have been formed by bacterial action; by the addition of nitrogen from the air, through the agency of bacteria which may live free in the soil, or in symbiosis with plants, these plants being generally leguminous, as far as is known; and by the addition of nitrogen brought down by rain. It is seen that the first three of these influences tend to decrease the amount of nitrogen in the soil, while the others conduce to effect its increase. In considering the latter, the action of rain is negligible; figures given in the article show that the average amount of nitrogen added by rain, at Rothamsted, is only 3·84 lb. per acre, per annum. One of the chief conclusions reached, in this paper, is that where no special provision is made for bringing manure on to the farm, or for increasing the nitrogen content of the soil by other means, the fertility of the soil rapidly decreases until a state of equilibrium is reached, in which the losses of nitrogen are so far balanced by the gains from bacterial activity that the soil attains a level of productivity which, though lower than it was originally, remains practically constant.

Under natural conditions, the amount of phosphates in the soil is increased by the weathering of mineral particles and of the underlying rocks. It is decreased by the removal of plants and, to a certain extent, in drainage water. In cultivated soils, this decrease is likely to be larger, because of the special removal of crops, as harvest. There is, however, another cause of the loss of phosphates, to which perhaps, sufficient attention has not been given in the past. This is the application of large quantities of manure; though the exact manner of this is not yet understood. There is, therefore, a necessity, when it is designed to subject land to heavy dressings of manure, to consider the possible effect on the phosphate content of the soil.

Potash is added to, and taken away from, the soil in much the same ways as the phosphates; it is, however, likely to be lost to a greater degree in the drainage water. Experiments have shown that, when the extent to which potash salts are to be added, as manure is being considered, allowance must be made for the influence of phosphates on the potash compounds already existing in the soil. Soluble phosphates have been found to make these compounds soluble, and therefore more available for the use of plants. This effect has been proved to be increased by small applications of lime, on account of the liberation of potash brought about by it; lime in large amounts, however, has the opposite effect, in that it renders the phosphates insoluble, and therefore able no longer to act on the potash compounds.

The amount of lime in the soil is also subject to fluctuations, though these are not likely to be as great as those of the constituents that have been dealt with already. The importance of this substance may be summed up in its effect in preserving a good state of tilth, its use in preventing acidity, and the changes that it produces, in conjunction with other manures. The loss of this constituent from the soil is increased by the use of sulphate of ammonia; it is decreased when pen manure or nitrate of soda is employed.†

There is now left the examination of the conditions for the best existence of those living inhabitants of the soil which produce beneficial changes in it. Acidity and alkalinity have a great influence in determining what, among these, shall continue to exist and show the greatest effect. In a soil which is alkaline to the ordinary extent, the changes are such as lead to increased fertility; in acid soils, as is well known, changes take place which result in a decrease of productiveness, and the medium becomes unfitted for the support of plants. Among the chief causes which tend to increase this acidity are insufficient drainage, together with the presence of large amounts of organic matter, and the too great employment of ammonium sulphate as a manure.† Acidity is a condition that is most likely to arise in heavy soils containing little lime.

It is a comparatively rare circumstance, however, that cultivated soils are allowed to become so acid as to prevent them from bearing adequate crops. The conditions for the reduction in numbers of the favourable organisms are far oftener allowed to come into existence on account of insufficient tillage, or even because of the careless application of manures. The extent to which such organisms are present, in comparison with that of the harmful ones, is dependent upon the state of tilth, or texture, of the soil, so that a sufficient argument is provided for the exercise of thorough

* The *Journal of the Board of Agriculture*, Vol. XVII, p. 114.

† See *Journal of the Royal Horticultural Society of England*, Vol. LXX, p. 12, and *Agricultural News*, Vol. IX, p. 187.

cultivation. The same consideration shows the necessity for care and caution in applying manures, at any rate to soils containing little lime. Nitrate of soda reduces the condition of such soils by becoming converted into carbonate of soda which lowers the power of the clay particles to form floccules. The remedy for this is the use of superphosphate; a preventive measure is to apply some of the nitrogen in the form of sulphate of ammonia by mixing this with the nitrate of soda. Common salt and potash manures also cause injury to the tilth, because they increase the alkalinity of the soil through the influence of the lime in it. To prevent this occurrence, where it is necessary, these manures should be accompanied by superphosphate.†

The broad, practical interpretation of these facts is that a properly treated soil will remain productive and if, as is generally the case, it is expedient to increase its productivity by the use of artificial manures, the kinds and quantities of these must be decided by considerations of the extent to which their use will be profitable, and of the effects that they are likely to produce, in relation to the texture of the soil.

PRODUCTION OF SEEDLING CANES IN JAVA.

The following is a translation of part of an article which appears in the *Journal d'Agriculture Tropicale*, for January 1910, which is an abstract of a paper presented by the late J. B. Kobus at the last International Congress of Applied Chemistry, held in London. The experiments described were carried out at the East Java Experiment Station:—

The seed of the cane began to take a position of economic importance in the Java sugar industry when, following upon the first researches of Dr. Soltwedel in Java, of Messrs. Harrison and Bovell in the West Indies, Kobus took up the systematic work, which rapidly led to practical results, thanks to the valuable aid which he received from planters in the island.

In 1894, Bouricius succeeded in making the first cross between the Cheribon and the Morte de Fiji, which under the name of No. 247, occupied 35 per cent. of the plantations in Java. It was during the course of the same year that Dr. Wakker, after much patient research, gave an explanation as to why the greater number of canes were incapable of being self-fertilized; this was found to be owing to constitutional defects in the flowers.

The two seedling canes that are chiefly found in cultivation at present, though they have certain advantages, are not absolutely perfect in type. One, No. 247, is attacked by Sereh; the other, No. 100, does not grow well on different kinds of soil.

Kobus did not at all despair of attaining entirely satisfactory results, and continued his researches accurately, according to a plan which had been drawn up methodically. He tried to distinguish characters that were more especially marked: particularly resistance to disease and richness in sugar; at the same time he conducted a microscopic examination of the flowers in order to make certain that the structure of the central organs was normal. Evidence of the fertility of the pollen is obtained by the aid of a solution containing iodine. In order to prevent interference by foreign pollen, the arrows which are being cross-pollinated are confined in a cover of fine gauze. A single arrow is sufficient when self-pollination is being affected; but it is necessary to bring two arrows together under the same cover in order to ensure an effective crossing. In the last case, the female element is furnished, in preference, by a variety normally possessing sterile pollen—a phenomenon which is generally shown by canes of high sugar content. It has been ascertained that the dehiscence of the stamens of the sugar-cane takes place early in the day, most often between four and six o'clock, rarely later than nine o'clock, in the morning, and that the opening of the flowers may easily continue during five or six days. The drying up of the male arrow is prevented, during this lapse of time, by taking care to remove these inflorescences from the cover, for the purpose of keeping them, with the base of the stalk in water, until the early hours of the morning. In spite of these precautions, checks have been experienced, which physiologists have not yet succeeded in explaining satisfactorily.

The parent canes which are intended to take part in cross-pollination are submitted, during the preceding year, to a most rigorous chemical selection, prompted by differences of 10 per cent. in sugar and 20 per cent. in weight which have been observed between seedlings of the same varieties but from more or less rich parents.

The method described by M. Kobus is strictly followed at the East Java Experiment Station, where 16,000 to 32,000 seedlings are raised in this way every year. Unfortunately the greatest uncertainty exists as to the results, which are disappointing on most occasions. In the hope of lessening this considerable loss, the idea arose of sowing the seeds from successive crossings between four or five different varieties; the first trials made of this new method brought about greater success than when one crossing was employed.

At the first harvest, the seedling canes are submitted to a selection which is not less severe than that which took place before they were obtained. Those are taken out first which are obviously inferior in appearance; the others are analysed with a view to planting cuttings of those, only, which have a completely satisfactory sugar content. In 1907, the minimum of richness permitted had to correspond to a yield of 4 tons of sugar to the acre; at the present time, a minimum of 7 tons is required. Under these conditions, the double test in the field and in the laboratory only allows the survival, for replantation, of a feeble proportion, consisting of twenty-five canes in 10,000 seedlings. This average is reduced by two-thirds during the following year; in the fourth year, the few seedlings which have succeeded throughout this long series of special trials are cultivated in the experimental field, together with the best varieties that have been obtained. Those among them which undergo the comparison to their advantage are definitely classed, and propagated in sufficient quantity to permit of their distribution to those planters who are wishful to make trial of them.

The systematic application of this eminently scientific and rational method has saved the sugar industry of Java, on the eve of its suffering serious damage through several threatening fungus diseases; it has raised the yield of sugar from one of $2\frac{1}{2}$ tons in 1887 to one of $4\frac{1}{2}$ tons in 1908; in a word, it has contributed to the great development of cane plantations, and to their prosperity. It is believed that these results are amply sufficient for calling attention to the work accomplished by Kobus and his worthy fellow-workers.

FRUITS AND FRUIT TREES.

FRUIT EXPORTATION FROM NATAL.

A report on the export of citrus and other fruits from Natal to England, for 1909, has been submitted recently to the Government by the Commercial Agent for Natal in London. This appears in the *Natal Agricultural Journal* for March 1910, and deals chiefly with the market for the Naartje or Natal mandarin, in England. It shows that, during the season which is reviewed, the amount of this fruit arriving in London was too great for the demand, and in connexion with this there was pointed out the fallacy of believing that because a fruit comes from the colonies, a quick demand in England will necessarily arise. If such fruit arrives in small quantities and there is a want for it, high prices will result from the keen competition. If it is imported in large quantities and in a sound state, it will enter the competition as a fruit with other varieties that are already on the market.

The season about which information is given was by no means favourable, but it is pointed out that this experience of losses is a usual concomitant of the development of an oversea fruit trade, by almost any country. Attention is drawn to the example of Australia, where many years of effort were required before the fruit export industry was placed on its present successful basis. It is stated that, before this occurred, whole cargoes of wasted fruit were destroyed, but the shippers persevered, and by correcting their errors as they became cognisant of them, gave the country a flourishing industry. The moral is that, where a fruit-growing industry is being developed, the producers should not be discouraged, but should continue their efforts, with the exercise of patience, a proper regard to the requirements of the home markets and the scrupulous following of the information they are given in connexion with the cultivation, picking, packing and marketing of the fruit.

Packing fruit. It is recommended that packing for export be performed on the farm, subject to the control of Government inspectors, especially over those packers who do not belong to growers' or fruit associations.

The best fruits, only, should be exported. The trays employed for the purpose should not be too large; those used in Spain are of one count, namely 25s, the size of the fruit being denoted in millimetres, on the packages. For the Natal fruit, it is suggested that a tray 12 inches by 12 inches by $2\frac{1}{2}$ inches, and a lesser one 9 inches by 9 inches by $2\frac{1}{4}$ inches (outside measurements), containing eighteen or twenty fruits, would be most suitable to the trade, and this is confirmed by the buyers at Covent Garden. The suggestion is offered that trials might be made with double-layer trays, measuring about 4 or $4\frac{1}{2}$ inches in depth. The smaller trays are the most suitable for extending the provincial and suburban demand. Small trays containing eighteen fruits were quite popular, and the small 'glove' box (punnet), containing ten and twelve fruits also obtained a ready sale, chiefly on account of the fact that it contained just the amount of fruit that is required by a person when shopping.

It was found that, under the conditions of cold chamber storage, those fruits travelled best which were contained in closed trays and boxes. Such packages possess the additional advantage that, if the fruits in them burst, the juice does not run down into the other trays and detract from their value by spoiling the appearance. Whatever the kind of package that is used, it should be always uniform in size, and the particularly superior fruits should be wrapped in a special way, so as to distinguish them from the ordinary ones. A useful suggestion has been made, by the editor of the London *Fruit Grower*, that a few of the fruits in the middle of the tray should be partly unwrapped, in order to show their quality.

As material for binding the trays and boxes, iron hooping has shown itself to be not very satisfactory, chiefly on account of the difficulty of removing it, and the damage that is done to the packages in effecting the removal. Strong wire is suggested, as a substitute, for binding the smaller trays together; or this may be done in the Spanish way, by placing battens around a large number, and firmly securing them by a flat straw rope. It is pointed out that some Jamaica fruit growers employ narrow strips of hide for the purpose.

It is the conviction of the writer that conveyance in cool chambers is the only satisfactory method, at any rate for delicate citrus fruits like the Natal mandarin. During the season, the temperatures in the cool chamber averaged 36° to 38° F. The variation in the hold was from 55° minimum to 85° maximum. It was pointed out that the temperature at which citrus fruit from the West Indies and Florida is carried, in special chambers, is between 45° and 50°F., and it was suggested that if similar provision could be made for African fruits, much of the handicap in building up the business would be removed. The opinion is expressed that the highest cool chamber freight that can be borne by citrus fruits from Natal is 50*s.* per ton, and a ventilated hold

freight of 25*s*. per ton is not considered to be unreasonably high.

DISTRIBUTION AND SALE OF FRUIT. A careful study of the matters of distribution and methods of sale of the exported fruit has led to the following conclusions:—

(1) In introducing a new fruit, both the auction and private salesmen should receive consignments to sell, in order that it may be properly advertized and that the value may be fairly tested.

(2) That the best net results will be obtained by private salesmen, when the regular supplies are not too bulky, and the fruit is in good condition. Sent in this way, the fruit may be repacked for sale, whereas if it is put up to auction, a little waste in one box is likely to cause it to be sold at an unfair price.

(3) That, while it is undesirable for a monopoly of the selling to be effected, it is not good policy that consignments should be split up to too great an extent among salesmen.

(4) That, when a fairly large proportion of the fruit has been spoiled in transit, it should be put up to auction immediately.

(5) That, when it appears likely that a new shipment of fruit will reach appointed private salesmen while part of the last shipment is still on their hands, the private salesmen's weekly supplies should be reduced, and if necessary, the distribution of the fruit should be hastened by selling it at auction.

Covent Garden is recommended as the fruit market of the United Kingdom to which shipments should be mostly sent. This is because: (1) it forms the best distributing centre; (2) experiments in trying the English provincial markets are most easily made from it; (3) it sets the price of fruit, to some extent, and is followed by the provincial markets; (4) the concentration of fruit at Covent Garden avoids the trouble and expense of extra cartage, high railway carriage, possible damage of fruit from extra handling, and delays; and the rendering of account sales is facilitated. Direct services of steamers landing African fruit at Liverpool, Manchester, Glasgow, Hull or Bristol, would lessen the superiority of Covent Garden in these matters. It is recommended that, at present, Natal fruit should not be sent to Southampton, except in such quantities as are certain of a quick sale. Large lots unloaded at Southampton are generally consigned to salesmen in the Midlands and the North, who are also the clients of London salesmen: thus confusion is caused to such an extent, in some cases, that the fruit is despatched via London, with the result that the work and expenses are doubled. The present special use of Southampton would appear to be the opening up of markets in the West and South of England. It has not been found, as far as Natal fruit is concerned, to be a suitable distributing centre for the large provincial towns.

The report goes on to the consideration of methods of consigning fruit, and other matters. An account of these will be given in the next number of the *Agricultural News*

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados, on Thursday, June 9, by the SS. 'Ocamo', on an official visit to St. Vincent. Dr. Watts returned to Barbados, by the SS. 'Oruro', on Tuesday, the 21st. instant.

BOOK SHELF.

THE MODERN SUGAR PLANTER. A. B. Gilmore, 512, Camp Street, New Orleans. \$2, yearly.

As was announced in the last number of the *Agricultural News*, a new weekly journal, devoted chiefly to the interests of the Louisiana sugar industry, and published under the above title, is now being issued. The founder and publisher is A. B. Gilmore, who has recently resigned the position of manager and editor of the *Sugar Planters' Journal*, which post he has occupied during the past ten years.

The object of the paper is to enable the sugar planter in Louisiana to keep in touch with the events of interest to him that are taking place in that State. Judging from the first number, it should succeed in attaining that object. The information in this deals with the outlook for the cane crop; improvements, extensions and alterations in existing sugar-making plants in the State; sales of plantations, etc.; the Louisiana Sugar Planters' Association meetings; matters of personal interest; and, in addition, there is a section of the paper, under the title 'This and That', which enables matters not directly bearing on the sugar industry, but which are nevertheless of interest, to be given attention.

The journal is well printed, on good paper, and should be of use locally. It does not seem likely to be of as much interest outside Louisiana; its general use might, however, be increased, by making abstracts of much of the matter, instead of printing it *in extenso*, and by increasing the number of articles. It fulfils a purpose very like that of the already existing *Sugar Planters' Journal*, and there is the question as to whether there is room for two such similar papers—a question which the large and varied interests in such an important sugar-producing area as Louisiana may probably answer in the affirmative.

EFFECT OF COOKING RICE.

The following account of experiments conducted to determine the changes that take place when rice is cooked, is taken from the *Agricultural Ledger*, 1908-9, No. 5:—

In the preparation of rice for the table, a certain amount of its nourishing properties is removed in the water in which it is boiled. A series of experiments was made with four kinds of rice, in which 20 grains of analysed rice were placed in 110 c.c. of water and boiled for half an hour until properly swollen and soft. The water, or 'conjee', was thrown away, and the boiled rices were dried and analysed. Without quoting the separate figures, the average analyses are given:—

	Original rice.	Boiled rice from 100 parts of original.	Loss.
Water	12·74	3·13	...
Albuminoids	6·92	6·32	0·60
Fat	0·25	0·12	0·13
Carbohydrates	79·13	72·86	6·27
Fibre	0·34	0·38	...
Ash	0·62	0·51	0·11

The boiling, therefore, removes more than half the fat, over 8 per cent. of albuminoids, less than 8 per cent. of carbohydrates, and 17·6 per cent. of the ash.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 6, with reference to the sales of West Indian Sea Island cotton :—

About 200 bags of West Indian Sea Island have been sold since our last report. The sales include St. Croix, Virgin Islands and a few bags from St. Kitts, Montserrat, Antigua and Jamaica. Prices range from 20*d.* to 21½*d.*, and Stains realized 13*d.* to 15¼*d.* The market remains fairly steady.

The reports of the growing crop in Florida and Georgia are not too satisfactory, and as the fine trade is rather improving, we think good prices will obtain next season for West Indian Sea Islands.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 28, is as follows:—

The market has continued dull during the past fortnight, with apparently no demand for the Planters' crop lots remaining in stock and on plantation, aggregating upwards of 200 bales, which are still held at 38c., 40c. and 50c., in the absence of any demand.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the exports of cotton from the West Indies, for the quarter ending March 31, 1910:—

Origin.	Number of bales.	Weight, lb.	Estimated value, £	s.	d.
Antigua	164	36,736	2,689	17	4
Barbados	609	305,946	19,121	12	6
Grenada	120½	36,336	1,775	6	8
Montserrat	433	136,157	10,211	15	6
St. Kitts	295	110,171	8,262	16	6
Nevis	278	79,761	5,982	1	6
Anguilla	139	27,800	2,085	0	0
St. Vincent	764	370,369	19,433	10	10
Trinidad } Tobago }	23	5,237	...	...	...
Virgin Islands	50	11,229	701	16	3
St. Lucia	37	7,400	524	3	4
Jamaica		none			
Total	2,912½	1,127,142	70,788	0	5

All this cotton was sent to the United Kingdom, with the exception of 28 bales (14,147 lb.), of an estimated value of £884 3*s.* 9*d.*, which was shipped from Barbados to the United States. With the exception of 106½ bales (31,856 lb.), of an estimated value of £1,313 6*s.* 8*d.*, of Marie Galante, all the cotton shipped was Sea Island.

THE BRITISH COTTON-GROWING ASSOCIATION.

The *Fifth Annual Report of the British Cotton-Growing Association*, for the year 1909, a copy of which has been received recently, points out, after making due acknowledgement of the assistance which has been given in various ways during the year, that the recent failure of the cotton crop, both in America and in Egypt, has now presented undeniable proof that the very existence of the Lancashire cotton trade depends on the rapid development of new cotton-growing areas in other parts of the world. Reference is made to the inadequate response from Lancashire to the first appeal of the Association for capital, six years ago, and it is pointed out that if the recognition of the necessity for the provision of additional sources of the supply of cotton had been made at that time, the work of the Association would now have advanced to such a stage, that all that might have been necessary at present would be the provision of sufficient capital for the development of those areas where the trials had been successful. Notwithstanding this want of means, sufficient progress has been made in certain parts of the world, especially Nigeria, Uganda, Nyasaland and the West Indies, to show that it only requires adequate capital for the cotton industry in these places to be developed largely and rapidly. The efforts of the Association, however, cannot be confined to such work, as other countries which can grow good cotton are awaiting development.

In consequence of the serious state of the Lancashire cotton trade which has arisen on account of the failure of the American and Egyptian crops, it was decided by the Council, in September last, to make a further appeal for capital, and to enter into negotiations for the support of the Federation of Master Cotton Spinners. A favourable report was made by a Committee, which was appointed to enquire into the work of the Association, and into the prospect that additions to the funds would be justified: and a recommendation was made that subscriptions should be requested from the cotton trade, on the following basis:—

Spinners, £2 per 1,000 spindles, spread over five years.
Manufacturers, 1*s.* per loom, spread over five years.
Operatives, 1*s.* 3*d.* each.

At the present time, this scheme is receiving ready support from the Federation of Master Cotton Spinners, from the North and North East Lancashire Cotton Spinners and Manufacturers' Association, as well as from the operatives' associations.

The experiments which were outlined in 1908, for the purpose of making trial of cotton seed as a fuel for providing motive power, have been successful up to the present, and a plant is working satisfactorily at Lagos. The trials are to be extended by the erection of another plant in East Africa, and

further extensions will be made in Northern Nigeria and Nyasaland. As regards the provision, by the Association, of hydraulic baling presses, four of these are doing good work in Nigeria, and extensions are being made at Kisumu, on Lake Victoria, and in Nyasaland. It is proposed to erect presses in each colony, as soon as the output of cotton justifies the expenditure, which will be available for use by all planters, and by means of which freight charges will be considerably lowered.

Attention is drawn to the fact that the necessity for the scientific development of agricultural matters, especially of cotton in the tropical colonies, has been brought continually before the British Government by the Council of the Association. The statement is made that, although the Council does not pretend to the possession of scientific knowledge, it is 'convinced of the absolute necessity of some central authority, which can advise and direct all who contemplate the cultivation or development of tropical products, and which can collect, collate, and disseminate valuable information, which is being obtained every day from various parts of the Empire'. An expression is made of the recognition of the fact that, owing to the representations of the Council, the Government has appointed a Scientific Committee for these very purposes, but this is regarded merely as a preliminary step toward the large development of the scheme.

In dealing with the West Indies, the report draws attention to the fact of the succession of Dr. Francis Watts, C.M.G., to Sir Daniel Morris, K.C.M.G., as Imperial Commissioner of Agriculture. Referring to the reduction in the area of cotton in the West Indies, it is stated that this is not altogether unsatisfactory, as it has been shown that cotton cultivation cannot be taken up without serious attention to its needs, with the result that the industry has been placed on a sounder basis, which provides hopes of steady extension year by year. It is also stated that there is no doubt that the demand for high-class cotton will continue to grow, and the report goes on to say: 'it is therefore all the more necessary to encourage its growth in the few countries where the cultivation of Sea Island cotton is possible. This is the more essential, in view of the probability of the boll weevil reaching the Atlantic States in a very few years. So far, the only method discovered, of fighting this curse, is by planting early maturing varieties, so that the crop can be gathered before the ravages of the boll weevil become serious. Unfortunately, most of the early maturing varieties are short in staple.'

After dealing with West Africa, the Gold Coast and Lagos, the report states that the production of cotton near Illushi, Southern Nigeria, does not advance as rapidly as could be wished. The quality of the cotton, however, is excellent, and it is fortunate that the abandonment of this centre was prevented by a grant of £10,000 per annum from the Imperial Government, so that the Council has been able to make arrangements for the continuation of the work in this district for a further period of three years.

The report goes on to give particulars of the industry in Northern Nigeria, British East Africa and Uganda. In connexion with the last-mentioned place, it is stated that, owing to the great competition among cotton buyers, prices are being paid to the native grower which leave little margin for profit to the buyers, so that, ultimately, the price in Uganda will have to be reduced, with the possibility that the native producer will cease to plant cotton. The Council suggests that the best policy, under these and similar conditions, is for the buyers to fix the highest possible price that can be maintained over a series of years.

As regards Nyasaland, a most successful year is reported. It appears, however, that in Rhodesia the position is not entirely satisfactory, and that better results will probably be obtained, eventually, by encouraging native cultivation, than by growing plantation cotton.

The report states that the disastrous failure of the Egyptian crop of 1909 is likely to be a serious matter for the Lancashire cotton industry, especially as there can be no confidence in an increased production of long-stapled cotton by the United States, on account of the serious extent to which the boll weevil is present in that country. Figures are given to show that the yield of cotton in Egypt is gradually decreasing: for instance, in the quinquennial periods 1896 to 1900, 1901-5, and 1906-10, the respective yields were 5·48, 4·67 and 4·09 kantars per feddan (5·48 kantars per feddan is given as approximately 490 ℔. per acre). Among the reasons that have been suggested for this are the change from a three-year to a two-year rotation, and the elevation of the level of the subsoil water throughout the delta, owing to the raising of the level of the irrigation canals. The second cause would operate by bringing about conditions through which the tap root of the cotton plant quickly reaches a region of the soil which is stagnant, undrained, and unventilated. If this supposition is correct, the outlook is very serious, on account of the time that must elapse before works can be undertaken to a sufficient extent for the purpose of draining away this subsoil water The report goes on to point out that a special commission is making enquiries into the whole question, and states that the situation is most serious, and that the position of those employing Egyptian cotton is most precarious—a circumstance which is shown by the high prices that have been paid lately for Egyptian cotton, in comparison with those for the American product.

ST. VINCENT AGRICULTURAL SOCIETY.

At a general meeting of the St. Vincent Agricultural and Commercial Society, held on the 4th ultimo, attention was drawn to the fact that, owing to the adoption of implemental tillage on a somewhat large scale in St. Vincent, difficulty was being experienced in obtaining mules for working the implements. The importation of mules was almost out of the question, owing to the high prices that were asked for them, and a resolution was carried, asking the Government if it would be prepared to assist the Society, by means of a substantial bonus, for the importation of a suitable stallion donkey, in order that mules may be bred in the island.

An important letter from the Administrator was placed before the meeting, in which reference was made to the fact that the destruction of old cotton was not general in the island, and the opinion of the Society was asked as to whether legislation should be introduced with the object of enforcing such destruction. In the discussion, the Agricultural Superintendent stated that neither he nor the Cotton Inspector could, at the present time, insist that any person should destroy old cotton plants. He made reference to the pests and diseases which would be lessened in number by the destruction of the old plants as soon as possible after the crop had been picked, and to the damage done by cotton stainers, at the same time urging planters to destroy the native trees on which these insects live.

After further discussion, it was decided that a special meeting should be held, for the purpose of giving proper consideration to the whole question.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial treats of Changes in the Soil and its Fertility, with special relation to modern ideas of the interactions and reactions of manures and plant food already in the soil.

An interesting article on the production of seedling sugar-canes in Java, appears on page 195.

The abstract of part of a recent report on fruit exportation from Natal, on pages 196 and 197, serves to show some of the difficulties that have to be met, when an attempt is being made to build up a fruit export trade, even on the part of a large country.

The last annual report of the British Cotton-Growing Association is abstracted on pages 198 and 199.

The Insect Notes (p. 202) contain the first part of a series of articles on the Acarina, or Mites. These should be read in conjunction with the articles that have appeared already, on the life-history of insects and the orders of insects.

Some particulars of agriculture in British East Africa appear on page 203.

The Fungus Notes, on page 206, deal with Thread and Horse-Hair Blights.

A New Way of Preparing Vanilla Extract.

A number of the *Spice Mill* contains an account of the preparation of vanilla extract by a new process. According to the *Journal D'Agriculture Tropicale* for January 1910, this states that a cylindrical heater, which is provided with special openings and a vapour jacket is used for the purpose. The solvent employed is a mixture consisting of 40 per cent. of alcohol and 60 per cent. of water. The temperature is raised slowly, and is not permitted to pass above 38°C.

The essence obtained in this way contains a high proportion of extracted matters, and is of good quality, even when the pods employed are of inferior kinds.

Rubber Cultivation in Bolivia.

The *Board of Trade Journal* for May 19, 1910, gives information from a volume published recently by the Under Secretary of State in the Bolivian Ministry of Commerce and Industry, on the economic and financial situation in Bolivia. Speaking of rubber, it is stated that, after Brazil, the most important country in South America for the production of rubber is Bolivia, and that this fact is not generally known because that country possesses no ports, so that the rubber which is produced there appears in the statistics of Chili, Peru, Argentina and Brazil. The fact is that there is an immense territory in the State which is covered with magnificent forests of Hevea. According to the official figures, 1,899 tons of rubber, valued at £424,514 were produced in Bolivia in 1906; 1,802 tons, valued at £353,655 in 1907; and 1,789 tons, valued at £216,082. in 1908. It seems that the production of rubber in Bolivia is hampered to a serious extent by the fact that the export tax varies considerably in different parts of the country, its amount being left, apparently, to the discretion of the individual Customs authorities.

Importation of Indian Cotton into the United States.

The *Board of Trade Journal* for April 21, 1910, gives information from a report by the British Vice-Consul at Charlestown, on the trade of that district in 1909. This shows that, on account of the unusually high prices that ruled in the United States for cotton during the end of 1909, some of the Carolina cotton mills imported several hundred bales of cotton from India, for the purpose of making a trial of this, in competition with that grown in America. It is intended to continue the experiments with the cotton, which is of a somewhat shorter staple than the United States Upland cotton, but is said to be equally white and smooth. If the trials prove satisfactory (and there seems to be a certain amount of confidence of this), and the present high prices for American Upland continue, it is believed that larger orders will soon be made for the Indian article.

These facts derive an additional interest from the statement that this occasion is the first time, in the history of the mills in the Southern States, that Indian cotton has been purchased for use in them.

An Aid in Milk Testing.

Part of Bulletin No. 195 (February 1910) of the University of Wisconsin Agricultural Experiment Station, entitled *New and Improved Tests of Dairy Products*, deals with the discussion that has taken place in the past as to whether the fat column in the Babcock milk test should be read to the top, the bottom, or to some other point on the meniscus. It is pointed out that this surface can be made to take the apparent form of an almost straight line by pouring a few drops of alcohol into the neck of the test-bottle, after the test has been made, thus giving a uniform means of making the reading. At the same time, due consideration is given to the fact that the alcohol so employed dissolves some of the fat, and thus introduces an error into the determination, and it is proposed to avoid this source of error by saturating the alcohol with fat, before employing it for the purpose.

For preparing the fat-saturated alcohol, butter-fat, obtained by pouring off the fat from a quantity of melted butter, or by saving that separated in the cream testing, is employed. About a teaspoonful of this fat is added to 6 oz. of alcohol, in a bottle, which is warmed, and shaken until the alcohol is saturated with fat. For use, this alcohol is removed from the bottle by means of a glass tube passing through the cork, and nearly reaching the bottom of the bottle. In using such alcohol, the line separating it from the fat may be made more distinct by gently shaking the test-bottle at the end of the determination. One of the chief values of this method is that it makes the readings obtained, from both wide-necked and narrow-necked bottles, strictly comparable.

Breeders' Associations for the Improvement of Cattle.

Owing to the rapid development of dairy farming in the State of Wisconsin during recent years, attempts are being made toward the formation of Breeders' Associations for the Improvement of Dairy Cattle. The scheme for the organization of these is outlined in Bulletin 189 of the Wisconsin University Agricultural Experiment Station, entitled *Community Breeders' Associations for Dairy Cattle Improvement.* From this, it appears that thirty-one of these associations have already been organized in the State.

The bulletin shows that the purpose of such associations is to secure the co-operation of breeeders in the production of high grades of pure-bred dairy cattle, so that the community may gain the advantage of a good reputation as a breeding centre. The members can direct their attention along definite lines; their co-operation enables the demand, which has been created by co-operative advertising for good animals of a definite type, to be supplied; the meetings of the organization provide a means of keeping the members informed of the general progress that is being made; and protection against fraud and contagious diseases is more easily obtained.

In organizing such an association, a meeting is usually called, by some one who is interested in the matter, to which breeders are invited, and for which the services of a speaker who is capable of bringing forward the value of such organizations are retained. At this, or a subsequent meeting, a constitution and bye-laws are drawn up, and officers for the working of the organization are selected, with the result that an association is formed which can subserve the interests of a definite district.

The Powell Wood Process.

Reference to this process has been made already in the *Agricultural News* (Vol. VIII, pp. 249 and 408). It is stated in the *Colonial Office Journal* for April 1910, that the claim is made by the railway departments of Western Australia and Victoria, that the employment of this process renders the seasoning of timber unnecessary. A description is given of the process, which is stated to consist in heating green wood in a solution containing 30 per cent. of molasses. As the boiling point of this solution is higher than that of water, the sap in the wood is caused to boil before ebullition takes place in the solution itself. The result is that this sap water is driven out of the wood which is being treated, together with any air it may contain, so that when the solution is eventually allowed to boil, the latter is rapidly absorbed; the rate of this absorption is increased by allowing the solution to boil for a short time, only, and by letting it cool quickly. The timber which has been treated in this way is placed in steam-heated kilns for the purpose of removing superflous moisture, and a wood is obtained which can resist the attacks of dry rot and of white ants, the latter of which give considerable trouble in parts of Australia.

Abnormal Rainfall in St. Lucia.

A note has been received from the Agricultural Superintendent of St. Lucia, which shows that the rainfall in that island during last month was abnormal. The quantity registered at the Botanic Station was 21·95 inches, which, as is pointed out, is the record monthly rainfall for Castries for the last twenty years, with the exception of that registered in September, 1898, which was 25·28 inches. It is 15·10 inches above the average for May, during the same period, and its quantity has not been approached since May 1897, when the precipitation was 18·91 inches. This condition did not apply to Castries and district, only, for heavy rains have been general over the island, and records from various parts range from 12·37 inches in the dry districts, to 27·14 inches in those where the rainfall is generally high.

The effect of this abnormal rainfall has been to delay the cultivation of the land; it is stated, in fact, that such operations as weeding are practically impossible. The continuation of such weather would be unfortunate for the cacao industry, in view of the prejudicial effect on the normal setting and development of the pods, and the conditions which it supplies for the development of pod diseases.

INSECT NOTES.

THE ACARINA OR MITES.

PART I.

The articles which have appeared in the *Agricultural News* under the title of Natural History of Insects, and those which gave accounts of the several orders of insects, were intended to provide a brief outline of entomology. Mites and ticks are included by many persons among the insects, and though they are not true insects, they are closely related. It is now intended to give brief accounts of certain mites and ticks, showing how they differ from insects, and giving also the principal groups into which they are divided.

In order to present a fair idea of the position which the mites and ticks occupy with relation to nearly connected forms, it will be necessary to review the divisions of the Arthropoda, and of the Arachnida—that class of the Arthropoda in which is to be found the order Acarina, to which the mites and ticks belong.

References to the papers on the Natural History of Insects, and on the orders of insects, will be found in the *Agricultural News*, Vol. VIII, p. 410. It would be well for readers to refer to those articles, since many terms are explained there which will be used again in this and succeeding instalments.

The order Acarina includes a great many forms of insect-like animals which are of interest to the agriculturist. It is, therefore, proposed to give a brief account of the order in a manner similar to that in which the true insects have been discussed.

It will be remembered that the arthropods, or jointed-foot animals, are divided into four classes :—

Class I.	Crustacea	— Crabs, Lobsters, etc.
Class II.	Arachnida	— Spiders, Mites, Ticks, Scorpions, etc.
Class III.	Myriapoda	— Centipedes, Millipedes, etc.
Class IV.	Hexapoda	— Insects.

THE ARACHNIDA. The class Arachnida, which includes the mites and ticks, with other forms, is an extensive group. It is apparently very ancient in its origin, and its present day forms show much diversity in size, general appearance and habits.

The members of this class agree, as a whole, in certain characteristics, chief of which are the absence of antennae, the absence of compound eyes, and the presence in the adult of four pairs of walking legs, in all of which points they differ from the insects. They are never winged, and this is a further point of difference between them and the true insects. The Arachnida are air-breathing, the more common breathing apparatus being the pulmonary sac or lung-book, in which the respiratory tissue is arranged in plates like the leaves of a book. In certain forms, there are extended tubes resembling the tracheae of insects, though probably not homologous with them. Certain forms also effect respiration through the surface of the body, without any special organ for the purpose.

The mouth parts vary considerably, but usually consist of strong, biting mandibles. These are sometimes modified to form a piercing organ, as in the case of the ticks.

The body regions are more or less fused, the head and thoracic regions forming a cephalothorax, which bears the head appendages and the walking legs. The abdominal region in the spiders and scorpions is distinct, and in the latter is segmented. In the mites, the abdomen is fused with the cephalothorax, so that there is no distinct line of separation of the body into structural regions, though in certain forms, segments or body rings are distinguishable. The nervous system is ventral, and similar to that of insects.

The eyes are simple, or in many parasitic forms they may be absent. The circulation, also, is similar to that of insects, including usually a large dorsal vessel. The sexes are distinct.

The class Arachnida is composed of related orders, a list of which is as follows :—

Scorpionida	Scorpions
Pseudoscorpionida	Book Scorpions
Pedipalpi	Whip Scorpions
Solpugida	
Phalangida	Harvestmen, or Daddy-long-legs
Araneida	Spiders
Acarina	Mites and Ticks
Linguatulida	
Tardigrada	
Pycnogonida	

SCORPIONIDA. The scorpions are among the oldest, geologically, of all the arthropods. They are at present mostly to be found in tropical and subtropical countries. They have a broad cephalothorax, and an abdomen of thirteen segments, with a sting and poison gland in the last of these. The abdomen may be seen to be composed of two distinct regions, the 'pre-abdomen' of seven segments, and the 'post-abdomen' of six. The second pair of appendages, the pedipalps, are enlarged and chelate, i.e., provided with a pincers-like structure. The four pairs of walking legs are about equal in size. The sting is venomous, and though rarely fatal to man, is to be regarded as distinctly dangerous.

PSEUDOSCORPIONIDA. The book scorpions are minute arachnids of very little economic importance. They probably feed on small insects under bark of decaying wood, among old books, etc., where they are generally found.

PEDIPALPI. The whip scorpions inhabit the tropics and warm regions. They differ from the preceding in the structure of the pedipalps, which are smaller and less strongly chelate. The first pair of legs is elongated to form a whip-lash-like structure. The common form in the West Indies is the tail-less whip scorpion, in which the abdomen is very short and flattened. The bite of the members of this order is said to be venomous. The more common forms are commonly called tarantulas or scorpions in some islands.

PHALANGIDA. The harvestmen or daddy-long-legs somewhat resemble spiders. They have small, oval, or rounded bodies and very long, slender legs. They differ from the spiders in not having the abdomen attached to the cephalothorax by a stalk, and in not possessing any spinning glands. They feed upon flies and other insects, and are more abundant in temperate countries than in the tropics.

ARANEIDA. The spiders are the most conspicuous, and probably the most widely distributed of the Arachnida. The body is divided into cephalothorax and abdomen, joined together by a slender pedicel. The web-spinning habits of these animals render them conspicuous, and their sagacity in all that pertains to the capture of their prey has attracted much attention to their habits. They are useful in that of capturing insects, and though certain species are considered venomous, they are not often capable of inflicting serious wounds on man. Respiration, in the spiders, is by means of lung-books and tracheal tubes. The spinning glands are situated near the end of the abdomen.

ACARINA. This order includes the red spiders, poultry and bird mites, ticks, cheese mites, itch, mange and scab mites, and the gall mites. They have four pairs of walking legs, as adults, but often only three pairs when young. The mouth parts are formed for biting or piercing, sometimes for

sucking also. In habit they range from free to strictly parasitic.

LINGUATULIDA. This group of aberrant acarids consists of two genera, of only a few species, which in the adult condition inhabit the nasal cavities and air passages of dogs and other carnivora, and in the larval stage are to be found in the digestive tract of herbivora, especially sheep. The Linguatulida were long supposed to be tape worms, but they are now shown to be acarids.

The Tardigrada and the Pycnogonida are orders containing but few species, which are of no economic importance, and of such rare occurrence that they need not be considered further here.

A NEW MAIZE FROM CHINA.

Bulletin No. 161 of the Bureau of Plant Industry, United States Department of Agriculture, entitled *A New Type of Indian Corn from China*, gives an account of a new variety of maize, obtained recently from that country, which is summarized there in the form of the following conclusions:—

The variety of Indian corn here described was introduced from Shanghai, China, and appears to be distinct from all hitherto known types. The plants possess the following unique characters:—

(1) Erect leaf blades.—The leaf blades on the upper part of the plant stand erect, instead of being borne in a more or less horizontal position, as in the ordinary varieties.

(2) Monostichous arrangement of leaf blades.—In addition to the erect position of the blades, those on the upper part of the plant are in many cases all on one side of the stem.

(3) Silks developed while still inside the leaf sheath.—Instead of the ear pushing out before the silks appear, the silks are produced directly at the base of the leaf blades, before the young ears emerge.

(4) New type of endosperm.—The texture of the endosperm is unique, and cannot be referred to either the starchy or horny types common in our cultivated varieties. It resembles the horny endosperm in location and hardness, but differs in texture and optical properties.

The early developments of silks and erect leaf blades combine to produce an adaptation which ensures pollination, and prevents the silks from drying out. The pollen is blown against the erect leaf blades, and accumulates in their bases. The silks are pushed into these accumulations of pollen, and become pollinated before they are exposed to the air.

Xenia characters in hybrids appear for the most part to follow Mendel's laws. Coloured aleurone is dominant to transparent aleurone; yellow endosperm is dominant to white endosperm, and horny endosperm is dominant to waxy endosperm.

The discovery in China of a distinct type of maize has bearing upon the historical question whether maize was known in the Orient before the discovery of America. Though maize undoubtedly originated in America, the nature of the historical evidence regarding the extensive cultivation of maize in China in the latter part of the sixteenth century seems to preclude the idea of very recent introduction, leaving open the possibility that this specialized type of corn has developed in China. The generally accepted view to the contrary is further thrown into doubt by references to its widespread use, and introduction from the West, that occur in Chinese literature published during the sixteenth century.

In explanation, it may be stated that Xenia is the name given to the process by which pollen, in hybridization, has an effect on the character of other parts of a seed, or fruit, than the embryo; for instance, it has been found that, when ears of a yellow corn are pollinated with pollen of a maize whose distinctive colour is red, the resulting ears contain yellowish-red and dark-red grains as well as grains similar to those of the normal mother plant. The colour really resides in the aleurone layer of the endosperm, that is in the outer layer of cells of the plant food in the seed, which contain a large proportion of nitrogenous food-bodies. An extension of the statement that Xenia characters in hybrids appear mostly to follow Mendel's laws, in relation to the particular instance that is dealt with above, may be provided by saying, broadly, that if plants possessing coloured aleurone, or yellow or horny endosperm are crossed with those having colourless aleurone, or white or waxy endosperm, the resulting hybrids will all have seeds with coloured aleurone, or yellow or horny endosperm. (See *Agricultural News*, Vol. VIII, pp. 33, 34, 49, and 50.)

AGRICULTURE IN BRITISH EAST AFRICA.

An interesting letter has been received recently from Mr. H. Powell, Chief of the Economic Plant Division, Nairobi, British East Africa, who at one time held the post of Curator of the St. Vincent Botanic Station, under this Department.

At the time of writing, Mr. Powell was visiting the Nandi country, which is situated on an extensive plateau, about 6,000 to 7,000 feet high, near Lake Victoria Nyanza, and which is healthy and eminently suitable for occupation by the white races. Here, coffee trees of a type near *Coffea stenophylla* are indigeneous in the forest, and samples of the prepared beans have been valued in London, at 41s. 6*d*. per cwt. These forests are being inspected for the purpose of ascertaining if the coffee exists in paying quantities, and as the natives show no disinclination to the work of collecting the berries, it is probable that an export trade in wild coffee will be established. The berries are pulped by means of a small 'Jamaica' pulper. Mr. Powell had already paid a visit to this country, and, with the aid of a forest officer and the District Commissioner, had taught the natives how to obtain and coagulate the latex of a species of Landolphia, which is also indigenous there. The agent for coagulating the latex is a solution of salt and water, and as salt is an article of luxury among the natives, they chew the bits of rubber as they are formed and then place them together to make a small 'biscuit', in which shape it is carefully dried and exported to England. During last year, the rubber obtained in this way was worth £5,000 to £6,000. Other useful crops that are being raised successfully in this district are wheat and other cereals, and the natives are making gratifying progress in agriculture.

On the coast of the Protectorate, Ceara rubber and Sisal hemp are being grown extensively; the latter is also cultivated in parts of the highlands. The general state of agriculture is such as to present the likelihood that, in a year or two, the Protectorate will be completely self-supporting.

GLEANINGS.

Returns show that the area of cotton planted in Barbados during the year 1909 was 4,121 acres. Of this 3,620 acres consisted of newly planted cotton, and 501 acres of so-called 'ratoon' cotton.

The report by the Agricultural Instructor of Nevis, for March 1910, states that the yield of cotton has been fairly satisfactory, and that it is now certain that the area for next season's crop will be extended greatly.

The imports of rice into the United States, during the nine months ending March 31, 1910, were 81,000 short tons; in a similar period in 1908-9, they were 77,000 short tons. (The *Louisiana Planter and Sugar Manufacturer*, May 28, 1910.)

The amount of rubber exported from the Federated Malay States during the last eleven months of 1909 was 5,442,412 ℔. During the same period in 1908, the amount was 2,762,666 ℔., so that the increase for 1909 is 2,679,746 ℔. (*L'Agronomie Tropicale*, March 1910.)

Information has been received from Mr. H. A. Tempany, B.Sc., Chairman of the Permanent Exhibition Committee of Antigua, stating that this committee has decided to forward a collection of exhibits to the forthcoming exhibition at Toronto, and a smaller one to that of St. John.

The Uganda *Official Gazette* publishes rules made recently under the Uganda Cotton Ordinance, 1908. These provide for the registration of all cotton hand-gins in the Protectorate, and for the destruction, supply to the Government, export, or disinfection of all seed which comes from such gins.

The cotton crop of Peru, for 1907, amounted to 15,000 tons, valued at £584,441. This was an advance over that of the preceding year, and the outlook for 1908 and 1909 was reported to be most favourable. The amount of rubber exported in 1908 was 2,536 tons, valued at £604,311; in 1907, the exports were valued at £954,582. (*Board of Trade Journal*, April 14, 1910.)

A catalogue has been received of the Australian Monkey Jack, which appears to be very useful in effecting the removal of the stumps and roots of trees expeditiously and cheaply. The price of this runs from £5 10*s*. to £6 10*s*., with double purchase, and £4 10*s*. to £5 15*s*., with single purchase. These are made by a firm whose address, in England, is 6, Alma Street, Smethwick, Brimingham.

According to a report which has been received from the Curator of the Montserrat Botanic Station, this year's cotton crop in that island is likely to reach more than 200,000 ℔. of lint, though it may not come up to the crop of last year, which was one of 238,000 ℔.; the value will, however, be greater. The area planted was not more than 1,550 acres, or 700 less than last year.

Enquiries have been made recently in connexion with the cultivation of bay trees (*Pimenta acris*) in the island of San Jan, D.W.I. These have elicited the information that there is little of the nature of systematic cultivation of bay trees; the undergrowth is merely cut away, so as to permit the growth of the young trees that have been sown naturally. Trees are, however, planted out systematically, to a certain extent, on the estate of the Danish Plantations Company and at estate Lamesure.

The Agricultural Superintendent, St. Vincent, states that in order to enable the growers of Marie Galante cotton, in the islands of Canouan and Mayreau, to dispose of their cotton at a fair price, the Government has sent a sloop to the first-mentioned island and bought up the small growers' produce, paying on account a price which was more profitable than that obtained usually from dealers. A similar scheme was to be put in operation, in regard to the cotton in Mayreau.

The *Experiment Station Record* of the United States Department of Agriculture, for April 1910, gives an account of experiments which have been conducted recently in Russia with plants grown in water and sand cultures. These show that injury was done to the plants when magnesia was present, but lime absent; and that the yield became greater with the increase of the proportion of lime to magnesia. Loew's view that each plant has a definite lime-magnesia ratio, for the best growth, was not confirmed (see *Agricultural News*, Vol. IX, p. 95).

The exports of ginned and unginned cotton from Uganda for 1908-9, were 10,246 cwt. and 12,805 cwt., respectively. The similar figures for the period 1907-8 were 12,911 cwt. and 4,263 cwt. According to the *Colonial Reports, Annual*, No. 636, which gives the report on Uganda for 1908-9, the unginned cotton is ginned and baled in the East African Protectorate, and is exported from Mombasa as ginned cotton. Taking the loss in weight of seed-cotton, on being ginned as two-thirds, the quantity of lint exported from the Uganda Protectorate during 1908-9 shows an increase of 183 cwt. over that of the previous year.

The *Transvaal Agricultural Journal*, for April 1910, states that valuable research work in connexion with the breeding of corn has just been completed by the Transvaal Government Botanist. In this, it has been shown, after five years' trial, that maize follows Mendel's law in the matter of the production of hybrids, and an entirely new South African sugar-corn, comparable to American sweet corn has been produced. This is important, in view of the difficulty that has been experienced in growing sweet corn in the Transvaal. Experiments are now being conducted with the object of obtaining a variety of Hickory King corn which shall be characterized by an early ripening habit.

STUDENTS' CORNER.

JULY.

FIRST PERIOD.

Seasonal Notes.

The end of June, or the beginning of July, is a suitable time for sowing Bengal beans as a green dressing crop, or as a covering for lime trees, with the object of lessening the number of scale insects on those which are badly infested. Why is the Bengal bean, together with many other plants of the same kind, expecially suitable for the purpose of producing green dressings? What are the special uses of such dressings, in the soil? Do you know of any way in which similar provision is made in nature for plants that are to occupy the soil? Examine carefully, from time to time, lime trees badly infested with scale insects, and over which Bengal beans are growing, for the purpose of getting indications, if possible, of the way, or ways, in which the Bengal beans are helping to effect a reduction in the numbers of the scale insects. In order to give assistance in the making of such observations, the statement is made here that this action of the beans may or may not be due, wholly or partly to one of the following causes: (1) the improvement of the conditions under which the fungi attacking the scale insects may grow; (2) the protection given to the insects that are parasitic on the scale insects; (3) the possession of some property by the Bengal bean plant, itself, by which it is enabled to set up conditions which make it difficult, or impossible, for the scale insects to exist in its near presence. In giving these, there is no suggestion that the lines of observation should be confined to them. They are presented merely for the purpose of indicating the way in which a subject of inquiry that requires careful investigation may be approached.

As has been indicated already, a careful watch should be maintained for fungi that are living on scale insects, and thus helping to reduce their numbers. Useful assistance in finding and identifying such fungi is given in an article in the *Agricultural News*, Vol. VIII, p. 299. It must be remembered, in reading the descriptions presented there, that the part of the fungus which is most plainly seen, and which offers the most definite characters for the purpose of identification is the part often called the fruiting body. Those who have read carefully the two series of articles in the *Agricultural News*, entitled The Life History of the Fungi and The Chief Groups of Fungi that have appeared in Vol VIII, pp. 251, 267 and 283, and in Vol. IX, pp. 78, 94, 110, 126, 142, 158, 174 and 190, will be entirely cognizant of the fact that this fruiting body is merely the spore-producing part of the fungus, and not the fungus itself. The real work of feeding on the attacked scale insects is being done by the vegetative part of the fungus, or mycelium, which is often not easily seen by the unaided eye; the fruiting body possesses importance in that it bears the spores, which become scattered abroad, and thus spread the fungus. This difficulty of seeing the mycelium must have account taken of it when attempts are being made to find out whether, or not, the scale insects are being attacked by fungi. It may be, that, although the fruiting body cannot be found, the fungus is present and doing some of its best work in destroying the scale insects. The fruiting bodies are, as a matter of fact, a sign, rather, that the work of the fungus is nearly done, for they are always most likely to arise, when the food-supply is getting small, or when the conditions are unfavourable to the fungus in some other way.

Cotton seed, for planting, should be selected carefully, either at the factory where it is bought, or on the estate, where it has been chosen already from the most likely plants, In making this selection, the following kinds of seed will be rejected: (1) all those which have not grown to their full size and proper shape (that is, aborted seeds): (2) all those which are smooth and black, and not in possession of a tuft of green fuzz. See Island cotton seeds that do not possess this fuzz, to a greater or smaller extent, produce plants that bear seeds having lint of inferior quality.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give some explanation of the fact that, while the leaves of most plants are green, their flowers are of some other colour.

(2) How would you perform seed selection for corn planting?

(3) Give an account of the methods for conserving soil moisture in your district.

INTERMEDIATE QUESTIONS.

(1) How is the deterioration of cane-sugar, on storage, brought about? What precautions would obviate this?

(2) Which is the more economical: a basic slag containing 14 per cent. phosphoric acid, and costing £4 per ton, or one containing 45 per cent. of phosphoric acid and costing £5 per ton.

(3) Give an account of the use of chlorophyll in plants. What is chlorosis?

THE MAINTENANCE OF THE PRODUCTIVITY OF SOILS.

The Bureau of Plant Industry of the United States Department of Agriculture has issued recently, as its fifty-seventh bulletin, *A Study of Crop Yields and Soil Composition in Relation to Soil Productivity.* This contains the results of investigations conducted with a large number of the soils of Europe and the United States, and the following summary of these is given at the end of the bulletin:—

A careful study of the data which have been presented appears to justify two conclusions.

(1) That the productivity of the newer agricultural soils of the United States and of the older agricultural soils of Europe, taken as a whole and for a nation, are not declining, as is popularly supposed. Individual farms deteriorate, and soils wear out, as they have always done, but, as a whole, it seems probable that we are producing more crops per acre than formerly. This is undoubtedly due to many factors: to better and more intelligent cultivation, more and better systems of rotation of crops, and, in later years, to intelligent use of fertilizers—three methods of control in the hands of every individual farmer. In addition, we must recognize the increase in farm animals and stock, the improvement in seed by selection and breeding, and the increasing density in population, which is forcing attention to more intensive methods.

(2) That, so far as our information goes, there is apparently no significant difference at the present time between the composition of the older agricultural soils of Europe and the newer agricultural soils of the United States with respect to potash, phosphoric acid, lime and magnesia.

FUNGUS NOTES.

THREAD AND HORSE-HAIR BLIGHTS.

Thread blights have been known to occur on cacao in the West Indies since 1905, when they were first found in Trinidad. They have been observed since, on the same host, in St. Lucia, Dominica, Tobago and British Guiana. Horse-hair blight (*Marasmius equicrinis*) also occurs on cacao in Trinidad. Earlier references to this subject will be found in the *Agricultural News*, Vols. III, p. 281; IV, p. 117 and VII, p. 237; also in the *West Indian Bulletin*, Vols. VI, p. 87, and IX, p. 179.

EXTERNAL SYMPTOMS.—An outbreak of the thread blight disease has been reported recently as occurring on nutmegs in Grenada. The description of the disease, as given by Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture in Grenada, is as follows:—

Running up, and closely adherent to, the shoots, could be seen a thin filament made up of interwoven hyphae, the filament being generally dark-brown or black, from the presence of a cementing substance. A branch of the filament is given off at every petiole, and, on reaching the leaf blade, ramifies on its undersurface into a network of closely adpressed silky web. The finer branches of the filament are almost invariably white. None of the specimens examined showed fructifications.

The thread blight was somewhat difficult to discover, owing to the thickness of foliage, but once the symptoms were discovered, it was found that practically every tree examined was attacked in a greater or less degree. Infected leaves were dry and papery, but seldom fell, and as a rule could only be detached by a sharp jerk. No cases of large branches having died back were noted, the disease at present being confined to small twigs and leaves. Numerous cases were seen of an infected leaf coming in contact with a twig or leaf of a neighbouring tree, adhering thereto, and finally becoming closely attached by the growing mycelium; this affords an index as to the rapidity with which the disease might spread, wind or birds acting as distributing agents.

It need only be added that, on the younger twigs and leaves, the threads are distinctly light-coloured, almost white; while on the harder parts, where they are older, they are very dark. On some leaves, soft pads of mycelium may be formed. These, when young, are of a white, woolly appearance; when older they become covered with some waxy secretion, as do the threads, and form small, dark, somewhat waxy lumps here and there on the leaf surface, usually on an angle between two branches of the thread, which is also dark and waxy in appearance.

MICROSCOPIC CHARACTERS.—The threads are composed of long, thick-walled, intertwined hyphae, rarely septate, and not anastomosing, showing very little branching. These hyphae become even thicker-walled when old, and their walls are brown in colour. There are also, in the threads and in the leaves, much finer-walled hyphae, quite hyaline and colourless, with numerous septa, freely branching and exhibiting the clamp connexions said to be characteristic of the Basidiomycetes. The two forms appear to belong to the same fungus. The hyphae can penetrate the leaves, and possibly the buds; they are unable to pierce the bark of woody twigs, but may possibly penetrate young green ones, though this was not definitely observed.

GENERAL.—A thread blight fungus, identified by Massee as *Stilbum nanum* (*Kew Bulletin*, 1898, p. 112), occurs on tea in India. This is supposed to be capable of spreading up the plant from the ground by way of the roots, as well as of attacking it from above. Both the identity of the fungus and its power of spreading underground are, however, uncertain; though this last point is worthy of attention, and careful examination should be made of the stems of all plants attacked by thread blight, to determine if the brown strands can be traced back to the roots. The fungus, in India, does not seem to be quite the same as that in the West Indies, as it appears from the descriptions to remain white and to form in some cases a white felt on the leaves. Horse-hair blight, attributed to *Marasmius sarmentosus*, also occurs on tea in India, as well as on jungle plants. (See Watt and Mann, *Pests and Blights of the Tea Plant.*)

In Ceylon, a thread blight resembling that found in India occurs on tea and on nutmegs, as well as on some jungle plants. It is, however, unidentified. It has been found in some cases, associated with horse-hair blight on tea, possibly due to *Marasmius sarmentosus*, and with the same blight on nutmegs, due to *Marasmius rotalis*. (Petch. *Tropical Agriculturist*, Vols. XXVI p. 224, and XXIV, p. 25.)

In Java, and the Dutch Indies generally, another form of thread blight has been found on tea. This is described by Bernard (*Bulletin du Department de l'Agriculture aux Indes Néerlandaises*, Nos. VI, XI and XXIII). It is white, or delicate pink, easily detachable, and forms a soft pinkish felt on the underside of the leaves. The pink colour on the leaves is due to numerous spores formed from free basidia arising from the hyphae. The fungus has been named *Corticium theae*, and is related to *Corticium lilaco-fuscum*, causing pink disease of cacao in the West Indies. Bernard thinks *Corticium theae* is very nearly related to the fungus identified as *Stilbum nanum* in India; this may be so, but it certainly differs in many ways from the fungus found on nutmegs in Grenada. One important point is that the Java fungus is unable to penetrate the host, even on the leaves. A fungus, closely allied to *Corticium theae*, occurs on nutmegs in Java, and according to Zimmermann, another species of *Corticium* causes thread blight of coffee in the same island.

Examination of specimens of thread blights in the Mycological Laboratory at the Head Office of the Department would appear to indicate that they may be due to different fungi in different cases; it did, however, seem that the fungus on nutmegs in Grenada is the same as one of the forms found on cacao in Trinidad.

The question of the identity of the fungi has been gone into at some length for this reason. If the mycelium is in general sterile, infection can only take place from the ground, as is possibly the case with *Stilbum nanum*; or from pieces of diseased leaves or twigs being brought by the wind or birds into contact with healthy plants. But if it is due to a species of *Corticium* forming spores on the leaves, another serious source of infection must be taken into consideration. Fructifications will most probably be found on old diseased material, and should be looked for. They may take the form of toadstools, as do those of the horse-hair blights, or they may appear as pink or lilac colouring on the under side of diseased leaves, if the fungus is a species of *Corticium*.

To summarize, there appear to be several forms of fungi capable of forming thread blights, some of which belong to the genus *Corticium*, some probably to other genera, while others may be related to, or identical with, horse-hair blights (*Marasmius* spp.). They are of very general distribution throughout the tropics, and occur on several host plants, among which may be mentioned, tea, coffee, cacao, nutmegs,

mango, sapodilla, bamboo, pois doux (*Inga laurina*), immortel, and other shade trees.

REMEDIAL MEASURES.—All dead leaves and twigs should be carefully removed by pruning, and burnt. If burning is impracticable for any reason, they should be very deeply buried with plenty of lime, in case the fungus is a ground saprophyte. The harder parts of trees showing the threads should be carefully washed with lime-sulphur wash, the fungicide being rubbed into the threads with a brush. If this involves too great an outlay, severe pruning might be resorted to, care being taken to determine that there are no threads on the main trunk. All neighbouring forest trees should be carefully examined for thread blight, as they might easily prove a source of infection.

It should be remembered that the disease may become serious if neglected, but can easily be kept in check if proper attention is given to it.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of May :—

The calamity that has befallen the nation by the unexpected death of King Edward VII has naturally had the effect of causing a complete stagnation in social and commercial movements, the nation being plunged not only into outward mourning but inward grief. Immediately the news became known, business at the principal commercial centres was at once suspended, and even at the time of writing, the effect of the shock has scarcely worn off.

In the drug and spice markets what business has been conducted has been on a limited scale, and quite of a normal character.

In individual articles, cocaine has been almost entirely neglected, while vanilla has fallen 6*d.* in the ℔., and rubber has dropped about 2*s.* per ℔.

GINGER.

The sales during the month have been slow. At the first auction on the 4th, the offerings of Jamaica amounted to 235 packages, all of which were bought in at from 51*s.* to 64*s.* for ordinary small dark to good middling; 264 packages of Cochin and Calicut were also brought forward, but found no buyers, 52*s.* being the price wanted for fair rough washed. At the auction on the 25th of the month, Jamaica was represented by 239 barrels, a few only finding purchasers at the following rates: 65*s.* for fair bright, 63*s.* for good middling and 53*s.* for good ordinary. A large quantity of Cochin and Calicut was offered at this sale, and all was bought in at 60*s.* for Calicut, 55*s.* for bright washed; 52*s.* 6*d.* for cuttings, and 48*s.* to 52*s.* 6*d.* for rough washed Cochin.

NUTMEGS, MACE AND PIMENTO.

At the first spice sale on the 4th, slightly advanced prices were obtained for nutmegs over previous rates, to the extent of 1*s.* 4*d.* per ℔. for small and medium, and 1*s.* 2*d.* to 1*d.* for the larger sizes. A week later, firm prices ruled, and 220 packages of West Indian were sold. Mace was disposed of at the first auction in the month at an advance of 1*s.* 2*d.* to 1*d.* per ℔. for West Indian, 30 packages being sold at from 1*s.* 9*d.* to 1*s.* 10*d.* for palish, 1*s.* 8*d.* to 1*s.* 9*d.* for pale and reddish, fair red fetching 1*s.* 7*d.* to 1*s.* 8*d.* per ℔. A week later, 72 packages of West Indian were disposed of at 1*s.* 11*d.* for good pale, 1*s.* 8*d.* to 1*s.* 9*d* for fair, 1*s.* 7*d.* to 1*s.* 8*d.* for dark red to fair red, and 1*s.* 2*d.* to 1*s* 6*d.* per ℔. for broken. The offerings of pimento at the beginning of the month amounted to 202 bags, of which only a few were disposed of at $2\frac{1}{8}$*d.* to $2\frac{1}{4}$*d.*; at the end of the month there was but little or no change, and a slow demand. Arrowroot has been in slow demand during the month. At the first spice auction, out of 420 barrels of St. Vincent offered, only 45 were sold, at 2*d.* per ℔. for fair manufacturing. At the same sale 10 half-barrels of Bermuda were offered and bought in at 2*s.* per ℔.

SARSAPARILLA.

At the first drug auction on May 5, sarsaparilla was represented by 35 bales of Lima-Jamaica, 21 of which were sold at 1*s.* 1*d.* per ℔. for fair, and 10*d.* to $10\frac{1}{2}$*d.* for rough and chumpy. Of native Jamaica, 26 bales were brought forward and 7 sold at 10*d.* to $10\frac{3}{4}$*d.* for dull to fair red. Thirty-eight bales of Guatemala, Mexican character, were bought in at $8\frac{1}{2}$*d.* per ℔. Four bales of Honduras were also offered and bought in. Genuine Grey Jamaica has been scarce throughout the month, though information was current that consignments would arrive in time for the first auction in June.

TAMARINDS AND LIME JUICE.

With regard to tamarinds, a firm tone prevailed at the beginning of the month; 124 packages were offered, 64 only being disposed of, namely, 44 from Antigua realized 12*s.* per cwt. for fair pale, in bond, and 20 of fair pale Barbados sold at from 14*s.* to 14*s.* 6*d.*, also in bond. East Indian black were bought in at 12*s.* 6*d.* per cwt. In the middle of the month it was stated that no concentrated West Indian lime juice was to be had, but at the close there had been some arrivals but only on a very small scale, the nominal value being quoted at about £18 10*s.* There was a quiet but steady trade in West Indian raw lime juice at prices from 11*d.* to 1*s.* 1*d.* per gallon.

TO PREVENT BEES FROM SWARMING.

The *Journal of the Jamaica Agricultural Society* for April 1910 gives hints as to the way in which bees may be prevented from swarming. The method is to visit every hive and remove two frames of the sealed brood, substituting two frames of foundation, being careful at the same time to leave the queen in the brood nest. This is, of course, taking for granted that, after the first extraction was made, all solid frames of honey were removed and brood combs were given in exchange, in the centre. The brood removed may be used for making increase, or if this not desired, a super may be placed on the top, so that an increase will have been gained from this brood when it hatches out. Such a plan will prevent increase being made too late in the season, with the consequent loss, and the extra work of feeding, in order to prevent desertion.

The use of swarming cells is not advised, as this tends to cause the bees to swarm all the more. The giving of room in the day that has just been stated is said to be the best means of avoiding the evils of swarming.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, June 7, 1910; Messrs. E. A. DE PASS & Co., May 27, 1910.

ARROWROOT—St. Vincent, $1\frac{3}{4}$*d.* to $3\frac{3}{4}$*d.*
BALATA—Sheet, 4/3; block, 3/7 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 52/- to 60/- per cwt.; Grenada, 48/- to 53/6; Jamaica, 44/- to 52/6.
COFFEE—Jamaica, 43/- to 57/-.
COPRA—West Indian, £27 to £27 5*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to $21\frac{1}{2}$*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
HONEY—31/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/1; concentrated, £18 10*s.* to £18 15*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{8}$*d.*; fair, $2\frac{3}{16}$*d.*; good, $2\frac{1}{4}$*d.* per lb.
RUBBER—Para, fine hard, 9/4, fine soft, 9/3; fine Peru, 9/2 per lb.
RUM—Jamaica, 2/- to 5/-.
SUGAR—Crystals, 18/- to 21/; Muscovado, 14/- to 15/; Syrup, 12/6 to 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., May 27, 1910.

CACAO—Caracas, 11c. to $11\frac{1}{4}$c.; Grenada, $10\frac{7}{8}$c. to $11\frac{1}{8}$c.; Trinidad, 11c. to $11\frac{1}{8}$c.; Jamaica, $9\frac{1}{4}$c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$15·00 to \$16·00; Trinidad, select, \$25·00 to \$26·00; culls, \$15·00 to \$16·00 per M.
COFFEE—Jamaica, ordinary, $8\frac{3}{4}$c.; good ordinary, 9c. to $9\frac{1}{4}$c.; and washed, up to $10\frac{1}{2}$c. per lb.
GINGER—$9\frac{1}{2}$c. to $12\frac{1}{2}$c. per lb.
GOAT SKINS—Jamaica, 54c.; Barbados, 49c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 49c. to 52c., dry flint.
GRAPE FRUIT—\$3·50 to \$6·00 per box.
LIMES—\$5·50 to \$6·50.
MACE—30c. to 36c. per lb.
NUTMEGS—110's, $8\frac{3}{4}$c. to 9c. per lb.
ORANGES—Jamaica, \$1·25 to \$1·50.
PIMENTO—$4\frac{1}{4}$c. to $4\frac{3}{8}$c. per lb.
SUGAR—Centrifugals, 96°, 4·27c. per lb.; Muscovados, 89°, 3·77c.; Molasses, 89°, 3·55c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., June 11, 1910.

CACAO—Venezuelan, \$11·15 to \$11·25 per fanega; Trinidad, \$10·90 to \$11·20.
COCOA-NUT OIL—\$1·09 per Imperial gallon.
COFFEE—Venezuelan, $10\frac{3}{4}$c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$4·75 to \$4·80 per 2-bushel bag.
ONIONS—\$2·75 to \$3·75 per 100 lb.
PEAS, SPLIT—\$6·00 to \$6·10 per bag.
POTATOS—English, \$1·90 to \$2·00 per 100 lb.
RICE—Yellow, \$4·40 to \$4·45; White, \$4·90 to \$5·00 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., June 21, 1910; Messrs. T. S. GARRAWAY & Co., June 21, 1910; Messrs. JAMES A. LYNCH & Co., June 13, 1910.

ARROWROOT—St. Vincent, \$3·40 to \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$18·00.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., scarce.
HAY—\$1·20 to \$1·40 per 100 lb., dull.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$1·00 to \$2·50 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·25 per bag of 210 lb.; Canada, \$3·45 to \$3·50 per bag of 120 lb.
POTATOS—Nova Scotia, \$1·00 to \$2·40 per 160 lb.
RICE—Ballam, \$4·58 to \$4·90 (180 lb.); Patna, \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, June 11, 1910; Messrs. SANDBACH, PARKER & Co., June 10, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·00 per 200 lb.	\$8·00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	\$1·20	No quotation
CASSAVA STARCH—	\$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	$14\frac{1}{2}$c. per lb.	$14\frac{1}{2}$c. to 15c. per lb.
Liberian	$8\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$4·00 to \$4·10 per bag of 168 lb.	\$4·10 per bag of 168 lb.
Green Dhal	\$5·75	—
EDDOS—	\$1·04	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	3c. to $3\frac{1}{4}$c.	$3\frac{1}{2}$c.
Madeira		No quotation
PEAS—Split	\$5·90 to \$6·00 per bag (210 lb.)	\$6·10 per bag (210 lb.)
Marseilles	\$4·00	No quotation
PLANTAINS –	12c. to 60c. per bunch	—
POTATOS—Nova Scotia	\$2·25 to \$2·40	\$2·50
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	\$2·00 per bag	——
RICE—Ballam	No quotation	\$4·75
Creole	\$4·50	\$4·50
TANNIAS—	\$1·68 per bag	——
YAMS—White	None	——
Buck	None	—
SUGAR—Dark crystals	\$3·05 to \$3·10	None
Yellow	\$3·70 to \$3·80	\$3·70
White	\$4·00	\$4·00
Molasses	\$2·25 to \$2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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CONTENTS.

The Canadian Exhibitions, 1910.

AS is well known, exhibitions to be held in the Dominion of Canada, this year, in which the West Indies are interested, will take place at Toronto, and St. John, New Brunswick. The former of these opens on August 27, and closes on September 9; that at St. John lasts from September 5 to 15, 1910.

During the past few years, special efforts have been made in order to give the West Indies adequate representation at the Canadian Exhibitions. These efforts are being continued, and in some cases augmented, this year, as there is a general recognition of the fact that the work of the past will be undone, to a great extent, unless particular energy is put forward, not only in order to keep the representation of the West Indies up to its former standard, but to effect an improvement on it. This is not the only argument, however, for careful, well considered and thorough work, on the part of Permanent Exhibition Committees. It is evident that the holding of the recent Royal Commission on Trade Relations between Canada and the West Indies makes it a matter of great importance that the West Indies should do as much as possible to show how their resources can be developed, and that they are willing to effect what they can toward improving those relations, in every way.

The second of the two exhibitions, in the order mentioned above, is what is known as the Dominion Exhibition. It is national in character, being supported by means of a large grant from the Dominion Government every year; and it is held in different towns, from time to time, in accordance with the idea of its being a possession of the people of Canada.

Representations at both of these exhibitions, by means of one exhibit is not feasible, owing to the dates on which they are to be held—the Dominion Exhibition opens five days before the closing of the one at Toronto. This has made it necessary, where it has been decided to show at both exhibitions, to make arrangements for the preparation of exhibits in duplicate. The adoption of this policy would seem to be preferable to the one by which only one set of exhibits is to be forwarded,

that is where the interests of the particular colony, and the funds at the disposal of its Permanent Exhibition Committee, are such as to justify the preparation of two exhibits. Canada is a country of large distances; and although communication and transport are easy, Toronto has its special use as an exhibition centre for the country on the borders of the Great Lakes, including the City of Ottawa, and Montreal and Quebec, while St. John is more specially useful in the same way to the province of which it is the capital, and to Nova Scotia, Prince Edward Island, with Halifax and Charlottetown. The scope of the latter exhibition will, however, be much wider than this, more particularly on account of its national nature.

At both of these exhibitions, space will be provided free to West Indian exhibitors, and the exhibits will be placed under capable supervision, without any charge being made for this. As before, Mr. Charles Pickford, of the firm of Pickford and Black, has undertaken to receive and arrange exhibits from the West Indies, at both exhibitions, and the steamers of this firm will convey all material for them free of cost.

As regards the dates of despatch of this material, non-perishable exhibits for Toronto should he ready for shipment by the steamer which leaves British Guiana on July 21, and arrives at Halifax on or about August 10. Perishable articles for Toronto should be shipped by the boat which leaves British Guiana on August 4, and reaches Halifax on August 22.

In continuation, as regards St. John, non-perishable articles should be ready to be sent by the boat which leaves British Guiana on August 4, and arrives at St. John on August 22. The similar dates in connexion with the despatch of perishable articles for St. John are August 14 and September 3. It is evident from this, that the perishable articles for the exhibition at Toronto should be shipped by the same steamer as the non-perishable material intended for St. John.

Information in connexion with the packing and forwarding of exhibits is given in the *Agricultural News*, Vol. VII, pp. 145-6. This may be summarized, as follows: (1) the specimens forwarded should be genuinely commercial samples; (2) liquids, fine powders such as starch preparations, and sugars, should be put up in tightly closed glass jars and bottles; (3) samples of dried products are best enclosed in neat boxes with sliding, glazed lids; (4) information, as complete as possible, which may be of use to buyers, should be forwarded with the samples; (5) decorative material should be sent; (6) just before they are packed, all bottles, jars, etc., containing specimens and samples should be carefully examined, to see that there is no leakage from them; (7) all glass containing vessels should be packed especially carefully; (8) the labels descriptive of the contents of the bottles and jars should be placed near the bottom of them, so that the sample which each contains may be seen clearly; (9) each package and vessel should be numbered, and a list should be forwarded to Messrs. Pickford and Black, giving the numbers and corresponding contents; (10) where fresh fruits, etc., to be displayed in glass bottles, are forwarded, they should be placed in a 4-per cent. solution of formalin; (11) where possible, handbooks descriptive of the colony from which the exhibits are being sent should be forwarded, as well as pictures and postcards of the colony and its chief industries; (12) all correspondence concerning exhibits and exhibiting should be addressed to Messrs. Pickford and Black, Halifax, Nova Scotia.

Up to the present, arrangements are being made to send exhibits to Canada from Trinidad (showing methods of production and manufacture), Barbados, St. Vincent, St. Lucia, Dominica, Montserrat, Antigua, St. Kitts, the Virgin Islands, and British Guiana. Material will be sent to both exhibitions from Barbados, and this will be done in Antigua, as well.

A revised edition of the illustrated booklet entitled 'The West Indies in Canada', which has been issued annually by this Department since 1907 for use at the Canadian exhibitions, is at present being prepared. This is descriptive of the conditions and circumstances of production in the West Indies, and is intended to assist in arousing further interest in these colonies, on the part of Canada, as well as to present some idea as to their resources, and thus to help in giving the abundant available proofs that the West Indies and Canada are especially and naturally fitted to provide one another with commercial products.

Experiments have been carried out recently at the Washington (United States) Experiment Station, for the purpose of determining the effect of shading, in regard to various plants. As a general rule, it was found that, except in the case of plants that become very dry on maturing, the presence of shade greatly increases the moisture content, as well as the percentage of ash and crude protein.

In its broad effect, shading increases the percentage of moisture, mineral matter and nitrogenous matter in the plant, and there is an accompanying decrease in the percentage of carbohydrates (sugars and starch). This decrease is not, however, proportionate to the increase of the other constituents, and is not thought to be due to the smaller amount of the carbon assimilation, in the shade, but to other physiological causes.

THE JEQUIE MANICOBA RUBBER TREE.

The following is taken from a special article, dealing with the Jequié Maniçoba rubber tree (*Manihot dichotoma*), which appears in the *Tropical Agriculturist* for April 1910:—

During the past year, various owners of Maniçoba rubber land [in Brazil] have been directing attention to the culture of this tree. I visited several plantations, ranging from a few acres to 100 acres in area. I was anxious to investigate the cultural capabilities of the tree. The owners of these lands are ignorant of the lines on which this culture should be initiated. They take it for granted that sticking the Maniçoba seeds or cuttings into cleared ground is all that is necessary, without further attention. One important factor is in their favour: I refer to the wonderful tenacity of life and recuperative power pervading this plant. The primitive procedure by which the incipient seedlings and cuttings are left to take care of themselves with a view to establishing plantations, is antagonistic to the development of the trees, for nothing is more important than the proper treatment of young plants in the establishment of prospective great plantations. The result of the preliminary attempts in question was an aggregation of maltreated plants. In this connexion it may be noted that about half-a-dozen labourers only, men who know nothing about rubber cultivation, and who have nobody to instruct them, perform all the work appertaining to the upkeep of such plantations, comprising some 50,000 plants. Of course they have but few weeds to contend with—an important consideration—as they are in general suppressed by the peculiar soil and climatic conditions. I therefore could not help coming to the conclusion, that if these improvised plantations were placed under my control, I should replant them throughout. Anyhow, it is important to be able to add that I found two notable exceptions to this crude style of planting, one of which is concerned with a few thousand plants, and the other 50,000, on both of which intelligent methods of planting had been adopted. These two plantations, from a practical point of view, were decidedly encouraging. The seeds and huge cuttings or stumps had been planted only four months. The seedlings in this time attained a height of from 4 to 5 feet, and they were exceedingly healthy and vigorous. The huge cuttings are procured from the forest, that is to say, saplings in the forest are cut down and stuck into the cleared ground to form roots and permanent plants. These stumps measure from 6 to 8 feet in length, with both ends cut off, and in four months the vigorous shoots that spring from the top are 4 and 5 feet in length; thus there is a continuity of growth from the sapling to the established tree.

This plant is an invaluable acquisition to rubber cultivators. It can be cultivated at a minimum cost, consequent on its persistent tenacity and vigour, as is exemplified in its native soil, and because of its other merits, to which I have drawn attention. Further, it may be stated that the product of this tree is comparable with particular products cultivated in the tropics and elsewhere—products that flourish in a great measure by the restricted cultivation given. That is to say, when we discover a region pre-eminently adapted for a given culture, there it yields not only the best produce of its kind, but also far more economically.

Again, the humble dimensions of the Maniçoba tree, I am convinced, are a factor in its favour, from a cultural point of view, for it attains a size exactly suited for close planting. In the great Hevea plantations under cultivation in the East, close planting is systematically resorted to, with the object of forcing early crops, which are available from young trees of limited size; for numbers collectively far more than compensate for the production of rubber per acre from full grown trees widely planted. As a matter of fact, big trees are stated in the East to be an encumbrance.

The number of trees usually planted in the East runs from 100 to 200 per acre, sometimes more. The number of Maniçoba trees I advocate to be planted on one acre is 1,200. I estimate that 1,200 trees per acre (exclusive of certain returns in the fourth year) will yield 600 lb of rubber in the fifth year, and at least the same quantity annually thereafter for a long period of years. In many rich Maniçoba zones, I computed the number of wild trees at more than 100 per acre, some 25 per cent. being tappable trees, and most of the remainder saplings, the forest growth of which is sluggish as compared with that of those under cultivation. It may be observed that a wild tree occasionally yields 1 lb. of rubber at a tapping, but the average is far less. One of the subsidiary advantages to accrue from cultivation is that of systematic control of the cropping by a special staff of workers, for the itinerant collectors of wild rubber cannot always be counted on.

PRIZE-HOLDINGS COMPETITION IN GRENADA.

An appendix to the minutes of the proceedings of a special general meeting of the Grenada Agricultural and Commercial Society, held on April 1, 1910, gives a report on the Prize-Holdings Competition held in the parish of St. John's, Grenada, for the year 1909. According to this, there were thirty-eight entries in three classes: five in Class I, nine in Class II and twenty-four in Class III. The work done by competitors was as follows: none in Class I, two in Class II and fourteen in Class III, so that sixteen competitors worked their holdings for prizes under the scheme.

The first and second prizes were awarded, in Class II, to Adolphus Baptiste and John Francis, respectively. In Class III, the prizes were given in order as follows: Eliza I Mc.Intyre, Pomelia John, Freeling St. Louis, Rudolph Louison, Joseph Nahalsingh, Frederick Mc.Guire, Sylvester Jerome, the second and third prizes being divided equally between the two competitors successful to this degree.

The results showed that the chief weakness in all the holdings was in the matter of pruning; the forking was excellent, and draining was well done; but the drains themselves were not sufficiently deep

The examiners (Messrs. W. M. Malins-Smith and J. H. Burgess) state that they found two cases where dead leaves were burnt in the fields, and they drew the attention of the Agricultural Instructor to the frequency with which the tarring of dead wood on the trees takes place, in order that he may warn the peasant proprietors as to its uselessness. In the Grand Bay and Concord districts, very little thrips or black blight was found; there was a good deal of the latter, however, in the Gouyave valley district.

FRUITS AND FRUIT TREES.

FRUIT EXPORTATION FROM NATAL.

In the last issue of the *Agricultural News*, a partial abstract was presented, of a report on the export of citrus and other fruit from Natal to England, for 1909, which has been given recently to the Government by the Commercial Agent for Natal in London. The present article completes the abstract of this report, which appears in full in the *Natal Agricultural Journal* for March 1910.

In regard to the question as to whether fruit should be consigned direct to salesmen, or through general agents, the opinion is given that where a completely reliable broker is employed, there is no necessity to requisition the services of a general agent. The value of the services of the latter is, however, recognized in the following ways, especially in the matter of handling large consignments: the quantity of fruit to be placed on the market at one time can be regulated by him; he can arrange for fruit to be held in cold storage for better prices, or for its distribution to other markets; he can find other salesmen or auctioneers if he thinks that the interest of shippers can be served better by his doing this; he serves a useful purpose in providing a handy means for ordering and shipping the packing material required where the fruit is grown

The names of the private salesmen, auctioneers and general agents given in the report are repeated here, without prejudice to the claims of other firms to be considered:—

London. Messrs. T. J. Pourpart, Covent Garden, W.C.; George Monro, Ltd., Covent Garden, W.C.; and Charles Kauffman, Central Avenue, Covent Garden (private salesmen). Messrs. Garcia, Jacobs & Co., Covent Garden, W.C.; and Messrs. E. A. O'Kelly & Co., Covent Garden, W.C.; (auctioneers); Messrs. Mitchell, Cotts & Co , 65, London Wall, E.C., and Messrs. Perkins & Adamson (general agents).

Hamburg. Ferdinand Kugelmann, 13, Neueburg (private agent). August Stier, Hamburg, 8. Fruchthof, working in conjunction with Messrs. Gustaf, Schonfield & Co., Kaiser Wiljemstr. 47, Hamburg (auctioneers).

Antwerp and Rotterdam. Messrs. B. & M. Spiers, trading as the Netherlands South African Fruit Company, Leuvenhaven, 38, Rotterdam (agent).

Paris. Messrs. Omer Decugis et Fils, 57, Rue Saint Denis, Paris; and M. Hollier, 13, Boulevard Rochechouart, Paris (agents).

With regard to the matter of advertising, the following is a broad expression of the methods suggested: (1) the distribution of samples of fruit among the principal hotels, caterers and retail fruiterers, throughout the country where it is to be introduced; (2) the insertion of neatly printed cards, describing the special qualities of the fruit, in the trays and boxes in which it is exported; (3) the distribution of attractive bills, for display in fruiterers' shops and stores; (4) the insertion of attractive advertisements in all the fruit papers, and the chief daily papers; (5) the provision of money to be used in giving illustrated lectures, in the countries to which the fruit is exported; and (6) exhibits at the Royal Horticultural Hall.

Advice is tendered, in connexion with the export of fruit during the coming season, and this is presented below, in so far as it is of interest in the West Indies:—

Pineapples. The best packing material has been found to be corn husks, which should, above all things, be dry. The fruit was shipped from the Cape in boxes of three sizes, the outside measurements of the middle one being $28\frac{1}{2} \times 13\frac{1}{2} \times 5\frac{1}{4}$ inches; there were three boxes in each bundle, and the top one, only, was lidded. It is suggested that, for the Cayenne pineapple, the box known as the Azores half case, which is 22 inches square and 9 inches deep should be used. The box recommended for the Queen pine is one which will take ten and twelve fruits, according to size, allowing for sufficient packing. For pines of a good class, the boxes should be shipped singly and not bundled together in threes, two of which are not provided with lids, as this gives the fruit a 'cheap' appearance. During carriage at sea, ventilation appears to be better than cold storage.

Information is given with regard to the season of shipment of pineapples from other countries. From this it appears that the Florida pine reaches England between May and August, and is sold at 9*d.* to 1*s.* each, at first. The seasons and prices for the Jamaica pine (bull head variety) are as follows: January to early in March, 3*s.*; April, 4*s.*; April to August, 2*s.* to 3*s.* per dozen. Ripley pines from Jamaica obtain, during March, 4*s.* to 7*s.*; April to end of June, 6*s.*; July, 5*s.*; and August, 4*s.* per dozen. The bulk of the Azores pines is shipped between October and May, when an average of 1,500 to 2,000 cases arrive every ten days. If these are in good condition they obtain the following average prices: case of twelve 1*s.* 4*d.* to 1*s.* 6d.; case of ten, 2*s.* to 2*s.* 3*d.*; case of eight, 2*s.* 9*d.* to 3*s.* 6*d.*

The chief requirements of a good pineapple are stated to be: (1) a bright and even colour; (2) a fine, single crown, green and bunchy; (3) absence of specks and bruises; (4) clean appearance.

The latest rates for the carriage of pineapples in England are given as follows: London to Manchester 45*s.* 2*d.*; London to Liverpool 39*s.* 4*d.*; Southampton to Manchester 52*s.* 6*d.*; Southampton to Liverpool 48*s.* 7*d.* per ton. These rates include the cost of collection and delivery, within certain prescribed cartage limits, except in the case of Liverpool.

AVOCADO PEARS. There is a limited demand for these, and they must arrive in sound condition. The largest and greenest fruits obtain the best prices; these range during the year from 6*d.* to 1*s.* 3*d.* for each fruit. Avocado pears from Madeira are wrapped in tissue paper, for the purpose of preventing discolouration, and are packed in a box measuring 30 inches × 9 inches × 4 inches, having a division in the middle, and the sides ventilated to a small extent. Each of these boxes contains thirty to fifty fruits, according to size, together with packing material, which consists of dry corn husks.

CUSTARD APPLES. These must arrive green, packed in the same way as that for avocado pears, and about the same prices will be obtained for them. They meet a fair demand during the winter, but do not keep in summer.

GRANADILLAS. There is a doubtful demand for these, and the fruit is difficult to carry, even in cool chambers.

EGG PLANT. There is always a limited demand for this; the shape required is similar to that of the ordinary (Natal) cucumber, but a little shorter, and straight.

Information is also given in regard to French beans, tomatos, Cape gooseberries, green ginger, chillies (capsicums), and plums, but there is only an assured market for the last of these.

The information with regard to preserved fruits shows that there is an extensive market in Great Britain for crystallized fruit, and that this would form an opening for getting rid of surplus citrus fruit. There are good prospects for a finely flavoured pineapple put up in tins, either whole, in chunks, or in cubes. It is also the Commercial Agent's opinion that there is a great opportunity for the introduction of granadillas and other passion fruits, shipped as pulp, and put up in attractive jars or tins, with proper instructions as to the preparation for food.

Indian Soy Bean.—The *Indian Trade Journal* for November 11, 1909, gives information as to the analysis of fourteen samples of soy beans supplied by the Director of Agriculture, Bombay, and grown from seed of Japanese origin at the Manjri Experimental Farm. This shows that the moisture content varied from 9·90 to 12·06 per cent., while that of oil fluctuated between 16·44 and 22·48 per cent. The report on the beans states that eleven of the fourteen samples were distinctly good, and that those showing above 20 per cent. of oil were very good, the latter being better in this respect than the best Sakura Manchurian beans. For purposes of comparison, it is stated that the average Manchurian bean contains about 19½ per cent. of oil, of which about 6 per cent. is left in the cake. Further information concerning the percentage oil content of beans of different origin is quoted from the Reporter on Economic Products, India, as follows: Chinese, 17·60 to 26·18; Japanese, 13·36 to 25·55; Java, 18·37 to 26·18; grown in Europe, 15·16 to 21·89; grown in North America 18·42 to 19·52.

THE RELATION OF THE EAR CHARACTERS OF CORN TO YIELD.

An extensive series of experiments, conducted for the purpose of finding out what characters of the ear are associated with a high yield from corn, has been conducted at the Ohio Agricultural Experiment Station. These are to be continued indefinitely. A summary of the preliminary results are given, in Bulletin 212 of that station, as follows:—

(1) That the selection of seed ears of less than normal length, for a given variety or locality, will reduce the yield, and, if the selection be continuous, gradually shorten the length of ear.

(2) That shape of ear as regards cylindricity is a matter of less importance than many other of the prominent ear characters. While the tapering ears have, upon the average, led slightly in yield, the variation is neither important nor consistent, and more evidence is needed before a pronouncement can be made for either type.

(3) That the continuous selection of seed ears having 1 to 1½ inches of bare cob at the tip will increase the average amount of bare cob at the tip, diminish the total number of ears having completely filled tips, and decrease the yield of shelled corn per acre.

(4) That, so far as indentation of kernels is concerned, ears comparatively smooth—crease-dented—have proved somewhat superior in yield to the rough-dented ears.

(5) That, conditions of growth being equal, weight of ear, as made up of slight increases in length, circumference and amount of density of grain and cob, favours an increase in yield, and is worthy of consideration in the final selection of seed corn.

(6) That a knowledge of the previous conditions of growth is helpful in estimating the value of seed corn. And further, that seed for use under given conditions would better be selected under slightly inferior, rather than a very much superior environment.

(7) That the germination box can hardly be expected to pick out seed ears of superior hereditary merit. Its work is completed in atoning, in part, for carelessness in the handling of seed corn.

(8) That the main crop of corn on every farm should be planted with varieties known to be productive and acclimatized, and that importations of seed corn from a distance should be confined to a very limited area until, by careful selection, they have become adapted to local conditions.

(9) That a maximum yield of corn can hardly be secured under good soil conditions in this State with less than 12,000 plants per acre. This stand may be had with three plants per hill, in hills 36 inches by 42 inches.

An article in *Nature*, for May 26, 1910, deals with the latest work that has been done in connexion with pellagra. This work is being carried out by a field commission in Italy, consisting of Dr. Sambon and his assistants, and in pursuance of it, several pellagrous districts in Northern Italy have been visited for the purpose, among others, of searching the streams for possible carriers of the disease. Results, so far, have shown that the disease is not due to maize, as has been believed by many, but that it is probably carried by one of the sand flies—*Simulium reptans*—whose larvae are commonly found on the stones and rocks in the streams of the infected districts.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 20, with reference to the sales of West Indian Sea Island cotton :—

Since our last report about 200 bags of West Indian Sea Island cotton have been sold. These are chiefly comprised of St. Croix, 20*d.* to 21*d.*; St. Vincent, 21*d.* to 24*d.*; and a considerable quantity of Superior Stains at 15*d.* to 16*d.*

Owing to the recent fall in other growths of cotton, spinners are showing less disposition to purchase. Crop advices from America state that the Sea Island crop there is rather backward, and that rain is needed.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 11, is as follows:—

There has been some demand this week on account of the Northern mills, resulting in sales of two planters' crop lots, viz., 100 bales Coosaw, five bales Wave, on private terms. The factors continue to hold the remaining crops in stock at 40c. to 50c., thinking that the limited supply left unsold will be required by the trade before the next crop comes to market.

COTTON-GROWING IN THE FRENCH COLONIES.

During the year 1908, the industry made substantial progress in spite of some unexpected reverses. In Dahomey and in Senegal and Niger, the season was exceptionally dry, whilst in Algeria, the crop was considerably reduced by the attack of locusts. The total production of the colonies exceeded that of 1907 by only about 7 tons, but there are no grounds for discouragement, since decided progress was made everywhere except in West Africa. The approximate quantities of ginned cotton produced in 1907 and 1908 are compared in the following table :—

	1907.	1908.
	lb.	lb.
Senegal, and upper Senegal and Niger	88,620	40,240
Dahomey	201,630	130,170
Algeria	69,950	133,180
Guadeloupe	2,300	35,610
New Caledonia	...	11,020
Réunion	...	2,090
Madagascar and the Comoro Islands	...	23,040
Somali Coast	...	1,100
Tahiti	...	2,200
Total	362,500	378,650

(The *Bulletin of the Imperial Institute*, Vol. VIII, p. 16.)

COTTON LINTERS FOR PAPER-MAKING.

The *Monthly Consular and Trade Reports*, for February 1910, gives the following quotation from the *Paper Maker and British Trade* Journal concerning a machine known as the Minck and de Segundo machine, which removes completely the linters, or fuzz from the surface of cotton seed:—

Those who have followed events will have noticed numerous patents taken out with the object of utilizing cotton for paper-making purposes, and the floating of companies for this purpose. All attempts have proved failures, with a great deal of waste of capital, up to the introduction of a complete dry mechanical separation of the cotton fibre from the rest of the material. When this came forward a few years ago, we made a thorough investigation of the process in Germany, since which time we have had a great deal to do with it. Cotton seed hulls are now fed continuously, according to the patents of Minck and de Segundo, to a machine which produces a complete separation of the cotton. The fibres are automatically plucked, as it were, from the epidermis or shell by means of rapidly rotating arms of special construction. An air-blast through the machine draws the fibres away, leaving the husk to discharge from underneath the machine, free from cotton and in a condition available for cattle foods.

The ordinary cotton seed hulls, which a few years ago were regarded as being absolutely useless, became piled up round the mills until something had to be done to get rid of them, and to get rid of them they were burned under the boilers. As fuel they were only worth a few shillings a ton. Now, the position is being altered by the methods of dry mechanical separation. The cotton that can now be completely separated from the rest of the material becomes a valuable material in the manufacture of paper. It can be boiled and bleached very much in the ordinary way, and used for the best rag papers, for it is nothing more or less than pure, virgin cotton. It requires little or no beating, as regards the length of the fibre, for it is already about the right length. It requires beating, of course, in order to mellow it down to make it work wet by bruising the fibres under the roll. In the nature of things, it has a marked tendency to work very free.

The first-mentioned publication gives an abstract of additional information that appeared in the article, as follows:—

The cotton-seed oil mills sell their cotton-seed meal under standard guarantees of analysis, such as 55 per cent. protein and fat, 8 per cent. ammonia, etc., but when the product they are making runs higher than the minimum guarantee, they do not get a bonus for this excess. In such cases, most of the mills, to cut this excess down to their sale minimum

guarantee, adulterate the meal with cotton-seed hulls. The analysis is kept up to the minimum called for in the contract of sale, but the lint on the hulls that are put into the meal gives it oftentime a fuzzy appearance, which affects its feeding qualities, and is objectionable to the trade. There are numerous instances on record in which buyers have asked a rebate for the lint in the meal. Arbitration committees have sometimes awarded the buyer an allowance on account of this excess of lint, although the meal was up to the contract quality in every other respect.

Some of the Minck and de Segundo machines were seen in an oil mill at Marseilles, but the manager, considering the matter quite a secret, would give the writer no detailed information about them. He admitted, however, that the machine was a new invention, and that it was a great success.

TRADE AND COMMERCE OF CUBA, 1909.

It is stated in No. 4,427, Annual Series of the Diplomatic and Consular Reports, which has just been issued, that, from such data as are at present available, it appears that the trade of Cuba in 1909 showed signs of steady improvement.

The export of sugar from Cuba in 1909 was 1,431,538 tons of the value of £16,485,440, which is greater than that of the previous year by nearly £6,000,000, or rather more than 50 per cent. As is usually the case, nearly the whole of this sugar went to the United States; only 10,309 tons was sent to other countries. This large crop was due to the excellence of the harvest of 1908-9.

The crop of 1909-10 also promises to be very satisfactory, and reliable estimates place the yield at 1,700,000 tons; prices for the earlier part of 1910 are 25 per cent. higher than those at the same time in 1909. It is stated that European buyers are trying to secure Cuban sugars, and it is a fact that several cargoes have been sent already to Europe. This is a new development, and, while it has a favourable effect on prices, it puts Cuban manufacturers in possession of an additional market.

In regard to fruits, the pine-apple crop of 1909 formed a record, but remunerative prices were not obtained, in general. This was partly because the United States is the only accessible market at present, and partly because supplies reached the market on many occasions when it was already glutted, owing to the want of organization among fruit growers in Cuba. The export of pine-apples during 1909 was 1,280,000 crates of 80 ℔.; this exceeded that of the previous year by nearly 250,000 crates.

Little profit was attached to the export of oranges and other citrus fruits. The reasons for this are supplied by the fact that the growers are only small producers with little capital, for the greater part, and that railway and steamship charges are high. In addition, orange-growing in Cuba is still in the experimental stage, and many errors will have to be rectified before it can become a profitable industry.

The amount of tobacco produced in 1909 was 494,358 bales of about 120 ℔., having an estimated value of £9,000,000. That produced in 1908 reached 563,059 bales, so that there is a decrease of 68,701 bales. The value of all the tobacco exported during 1909 was £6,545,054, as compared with £6,735,212, in 1908. The state of the tobacco industry in Cuba has caused much anxiety to planters and merchants for some years, and a Commission was appointed in 1909 to inquire into it. This has issued a report which recommends, chiefly, that there should be greater care on the part of growers to keep up the high quality of Cuban tobacco, and to maintain uniformity in the product.

THE PREPARATION OF RUBBER FOR MANUFACTURE.

One of the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon (Vol. V, No. 4), describes a visit of Dr. J. C. Willis, Director of the Gardens, to the works of the Continental Rubber Company, of Hanover. Part of the information given is reproduced here:—

The first stage was the cutting up of the rubber, as received from the market, and in the room where this was going on many plantation marks were recognized. And here, Dr. Prinzhorn [the Director] made his first complaint against plantation rubber, that when it was in blocks, the blocks were too thick, and had to be cut up. He stated that the blocks ought not to be more than 1 inch thick. This is only a small point, but it is worthy of attention, none the less.

Cut into slices not over an inch thick, the rubber next went into the large washing and rolling room, which employed an engine of 1,000 horse-power. Along one side of this room, were about ten rolling machines, composed each of a large pair of cylinders, rotating at different speeds in opposite directions. At the near end of the room, these cylinders were strongly grooved, and as one went down the room the grooves became less and less marked, till finally one cylinder, and then both cylinders, were quite smooth. The rubber began at the coarsely-grooved cylinders and finished at the smooth ones, going through each pair in turn. By the crushing and tearing action of these rollers, which are kept warm, and between which a stream of water plays, the rubber is completely worked over, and all impurities are washed away, while the rubber is rolled into an irregular sheet, full of small openings, and becoming thinner and finer and more regular as the material goes through the smoother rollers at the far end of the room, which, besides being smoother, are also closer together.

The softer rubbers are washed with cold instead of hot water; and for the African rubbers, which are almost incredibly dirty, a special machine is used for the first part of the washing. This is known as the Holländer (Dutchman), and is in fact the machine used in paper mills to make the pulp. It tears the rubber into fine shreds, and passes it along through a considerable stream of water, the sand and other impurities falling to the bottom. From the Holländer, the rubber goes to the later, and smoother, rolling machines, omitting the passage through the coarser. This cleansing process, through which all rubbers must go, Dr. Prinzhorn did not think could be properly carried out upon an estate.

From the last of the washing and rolling machines, the rubber comes in thin irregular sheets, with numerous small holes in them. These are carried upstairs to a room not unlike a tea-withering loft, where they are hung for two or three days, or until thoroughly dry, in a temperature of about 40°C. or a little less (104°F.), over wires arranged in light wooden frames, like those of the tea witherers. The poorer African rubbers were not dried in this room, but in a cooler room above. Both rooms were fitted with red blinds, to provide a non-actinic light for the rubber, which is injured by exposure to bright light—just like a photographic plate, but in a less marked degree.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals with the Canadian Exhibitions which will take place at Toronto and St. John this year, and gives information with regard to forwarding exhibits from the West Indies.

On page 211 will be found an article dealing with the recent Prize-Holdings Competition in Grenada. On page 216, a similar article concerning that in Jamaica appears.

An abstract of the latter part of a report on the exportation of fruit from Natal, to which attention was given in the last number of the *Agricultural News*, appears on page 212.

Some particulars of the preparation of rubber for manufacture will be found on page 215.

The Insect Notes (p. 218) contain the second part of a series of articles on the Acarina or Mites. Fig. 33 is used by permission of the United States Department of Agriculture.

A review of the Mycologist's Annual Report to the Board of Agriculture, Trinidad, for 1909-10, is given on page 219.

The Fungus Notes, on page 222, deal with the latest work in connexion with cacao canker.

The West Indian Agricultural Conference, 1911.

With the approval of the Right Honourable the Secretary of State for the Colonies, and of his Excellency the Governor of British Guiana, the next West Indian Agricultural Conference will be held on January 12 to 21, 1911, at Georgetown, British Guiana.

By the courtesy of the Royal Mail Steam Packet Company, it is probable that a special steamer will be provided for the purpose of taking the delegates from Barbados to Demerara.

At an early date, specific communications will be addressed to the various West Indian Governments, with reference to the delegation of representatives to the Conference.

This preliminary announcement will give reasonable time for the preparation of papers and items of interest to be laid before the Conference, and work in this direction should be begun early.

Prize-Holdings Competition in Jamaica.

The report on the recent prize-holding competition in the parish of Trelawny, Jamaica, appears in the *Journal of the Jamaica Agricultural Society* for May 1910. This shows that the number of holdings entered was forty, thirty-seven of which were judged, the others having withdrawn; twenty-one were new competitors, the others had competed previously. The new competitors were successful in winning four regular prizes and one extra prize. It is stated that, although the number of entries was not large, it was very gratifying to see the amount of interest that was evinced in the competition.

A great deal of improvement had been made by all the competitors, in their holdings, several of these being of a permanent nature, and arising from suggestions that were made during the occasion of a previous competition.

It is pointed out that some of the competitors seem to think that prizes can be won by effecting a large cleaning up of the holdings just before the competition, forgetting that the real value of the work consists in steady progress from year to year.

In the first class, more attention was required in regard to the permanent crop, especially in the matter of pruning, and thinning generally. The general average of marks in the second class was below either of those in the other classes; here, there was a want shown in the matter of catch crops and live stock. A fair average of marks was obtained in the third class, but improvement is required in the growth of catch crops. It is recognized, however, that the small area of such holdings is largely responsible for this circumstance, as provisions are naturally cultivated elsewhere. In the result, the competition is stated to have been an interesting and successful one.

An account of the Prize-Holdings Competition in the parish of St. John's, Grenada, for 1909, will be found on page 211.

Imperial Expansion, 1902-8.

Information concerning the commercial growth of the Empire during the period 1902-8 is summarized in the *Journal of the Royal Society of Arts* for June 3, 1910. This shows that, during 1902, the total trade of the British Empire with foreign countries was £876,000,000, while in 1908 it had become £1,121,000,000. The trade within the Empire, during the same period, increased from £297,000,000 to £377,000,000, so that the augmentation of trade altogether was £325,000,000.

The remarkable expansion that has taken place in the amount of commodities produced by the Empire, during the same period, is pointed out, with the following illustrations. The production of coal, in the time under discussion, expanded from 241,000,000 to 301,000,000 tons; that of iron from 13,379,000 to 16,399,000 tons; that of cotton from 1,099,252,000 lb. to 1,479,041,000 lb. The similar increases for wheat were 410,000,000 to 541,000,000 bushels, and for gold from £30,000,000 to £53,000,000, in value. The journal goes on to point out that these figures, while they demonstrate the potentialities of the Empire, give but a faint indication of its ultimate productiveness, when the oversea lands are more adequately peopled, and more fully cultivated.

Artificial Production of Nitrates.

In the *Monthly Consular and Trade Reports* for March 1910, information is given, which has been obtained from various British Consular Reports, concerning the manufacture of nitrates from the air, in Norway. These show that, up to now, over a million pounds sterling has been spent on the works at Notodden and Svaelgfos, and the power stations which are being constructed at Rjukan and Vamma. On the completion of the work, at the end of 1910, a little over £3,000,000 had been spent. An important point in connexion with the industry is the opportunity which it has given for the founding of several minor industries in connexion with the manufacture of nitric acid and various nitrates for commercial purposes. A point worthy of notice is that no coal is used in the production of these substances, and it is stated authoritatively that the sale of saltpetre produced in this way will not be disturbed by competition with Chili saltpetre in the matter of price, for many years.

The Notodden works, together with the Rjukan works, when they are completed, will absorb 240,000 horse-power, and produce saltpetre of an export value of over £1,000,000. In 1908, the value of nitrates produced in Norway was about £111,666 and the expenses of production amounted to £83,750.

At the present time, ocean-going vessels cannot approach Notodden nearer than Skien, and all goods have to be carried by lighters between these places. Plans are being considered for the purpose of widening and deepening the water-ways, so that ships may be loaded and unloaded at Notodden.

Bur Grass.

An account of bur grass (*Cenchrus echinatus*) appears in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for May, 1910. This mentions that the grasses of the genus Cenchrus are known in Trinidad as bur grasses, sand burs, sand spurs and cock spurs. Dealing with the one especially under discussion, the account goes on to point out the injury that is inflicted on animals when feeding, and even on men while passing through the grass, through the strong spines on the burs which enclose the flowers and seeds. The wounds caused by them appear to be specially dangerous, as they are likely to cause lock-jaw, unless great care is exercised in cleansing them, and keeping them clean. The burs naturally form the means of distribution of the seeds, and through them the grass may be introduced into places that are many miles away from the areas where it exists already.

The grass grows best on dry, sandy or gravelly soil, but it is also commonly found on roadsides, in yards, in places where rubbish is deposited, and in gardens, in the last of which it may become a serious nuisance, as a weed.

Measures are suggested in the article for the purpose of the extermination of this plant. These consist in cutting off the spikes of the plant as soon as they appear, in order to prevent it from forming seed; or better, in pulling up the whole plant from the ground, and making heaps of it, which are allowed to become dry, and are then burnt.

Calcium Cyanamide and Nitrate of Lime.

In the present volume of the *Agricultural News*, pp. 169 and 185, the results of recent experiments have been given shortly, which show that calcium cyanamide and nitrate of lime posses a manurial value which is almost the same as that of nitrate of soda and sulphate of ammonia. It is of further interest to note that these results are supported by experiments that have been conducted during the years 1905-8, at the Aberdeen and North of Scotland College of Agriculture. An account of these is contained in Bulletin 13 of that College, an abstract of which appears in the *Journal of the Board of Agriculture* for May, 1910. According to this, the trials were conducted on a series of plots manured with equal amounts of nitrogen, potash and phosphate, the only difference being in the way that the nitrogen was supplied, this difference being brought about by applying it as nitrate of soda, sulphate of ammonia, nitrate of lime and calcium cyanamide. In each case, there were two other plots, one with no manure, and the other with the potash and phosphate, only. The first acted as a control in the matter of the soil productivity without manure, the second, similarly, in relation to its power to yield crops, without added nitrogen, but with potash and phosphate.

In the result, it is shown that calcium cyanamide was equal to nitrate of soda or sulphate of ammonia for grain crops, while nitrate of lime was rather more effective, weight for weight, than any of the other nitrogenous manures, probably because of its power to supply lime to the soil.

INSECT NOTES.

THE ACARINA OR MITES.

PART II.

Among the species included in the order Acarina are many forms which are of great importance in connexion with agriculture, on account of their depredations on both plants and animals. With the exception of the ticks, the members of this order are small, so small, in fact, that in many cases the organism is not seen until after the effect of its presence is demonstrated. Such pests as red spider, bête rouge, poultry mite, scab and mange mites, the leaf-blister mite and the ticks, are examples of this group of animals.

As the reader can judge from the few common names just given, the Acarina have very diverse habits. There is also a considerable variation in structure and habit. In the mites, generally, the body forms one closely connected structure, without division into regions such as the head, thorax, and abdomen of insects, or the cephalothorax and abdomen of the Scorpionida.

The adult mites usually have four pairs of walking legs, while the newly-hatched have only three pairs. The eyes are often small, and may be absent; the stigmata are generally wanting, and the mouth parts are adapted for piercing or biting, and sometimes for both biting and sucking. Certain species are entirely free-living and plant-feeding; others are parasitic on plants, forming galls on them; and others again are parasitic on, or in, animals of various sorts, from man to certain insects.

The Acarina may be divided, for convenience, into several families, which are as follows:—

I.	Trombididae—	The spinning mites.
II.	Bdellidae—	The snouted mites.
III.	Gamasidae—	The poultry mites
IV.	Ixodidae—	The ticks.
V.	Orobatidae—	The beetle mites.
VI.	Tyroglyphidae—	The scavenger mites.
VII.	Sarcoptidae—	The itch mites.
VIII.	Phytoptidae—	The gall mites.

The red spiders may be taken as good examples of the first family of mites. Although called red spiders, they are variable in colour; the older and more fully fed individuals seem to have a deeper colour than the younger ones. They are so small as to be practically invisible. Attention is generally attracted to them only when the injury which they do to the plants has progressed far enough to be noticeable.

The red spiders spin a web of very delicate silken threads, underneath which they live. The females lay rather large eggs, from which the young hatch in from six to eight days. The young mite is practically colourless, and has only three pairs of legs. The metamorphosis is gradual, the most marked change in appearance being the increase in the number of the legs, the adult mite having four pairs.

The red spider most common in the West Indies is *Tetranychus telarius*, which is often to be seen attacking sweet potatos. The mites live on the under side of the leaves, where they spin their webs. The drying and yellowing of the sweet potato leaves is often an indication of the presence of this pest, and when this condition is observed, examination reveals the presence of these mites, in all stages of development, under and in their webs.

Red spiders flourish best in dry, hot weather, and the advent of rain often checks an attack of the pest. Sulphur is a remedy for mites of all kinds, and may be applied for the control of red spider as a dust, or as a spray. The more practical way for field application would probably be the dry one, for which purpose, the sulphur would best be mixed with its own weight of slaked lime. Sulphur may be used as a spray, mixed with water at the rate of 1oz. to each gallon.

Cotton is often attacked by a red spider, probably not the same as that of the potato, but a related species. Roses also are attacked by red spider.

Fig. 33. A Red Spider. (Magnified.)

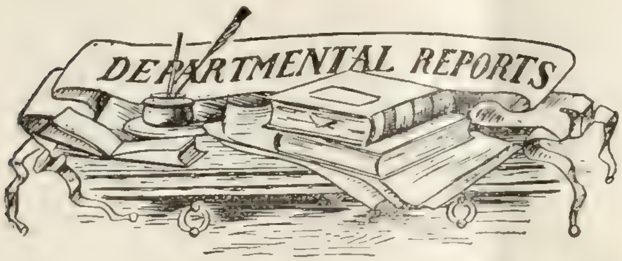
The Bryobia mite which, in many countries, is a serious pest on fruit trees, clover and other plants, belongs to this family. When these mites are very abundant, they sometimes swarm into houses, and cause considerable discomfort to the inmates.

Another pest well known in the West Indies for its irritating effect on man is the larva of a mite, belonging to this family, which is there called bête rouge. In England, this mite is called the harvest bug, and in the southern part of the United States it is often called chigger. In the West Indies, however, the term jigger, or chigoe, is applied to one of the true insects, which is really a flea (*Sarcopsylla penetrans*).

The parent or adult form of the bête rouge does not seem to be definitely known, although it is said to be *Trombidium holosericeum*. The harvest mite has been described as *Leptus irritans*, but it is now generally believed that Trombidium and Leptus have been applied to different stages of the same insect.

The very small, bright-red mites which are often found on the bodies of grasshoppers and beetles, belong to the genus Trombidium, and are either the adult form of the bête rouge, or closely related to it.

In many islands of the West Indies, bête rouge, at certain seasons of the year, causes very serious inconvenience. The regular dwellers in a locality where this mite is abundant seem to become accustomed to its attacks, or at least less susceptible to them, and to suffer but little, while strangers, especially visitors from northern climates, may undergo an extremely disagreeable experience at their first acquaintance with this pest. Bête rouge is very minute in size, reddish in colour; it inhabits grass and weeds in open fields, and may be found often in tennis lawns and other well kept grass. The animal attacks the ankles and lower limbs of the victims, and burrows into the skin, where it completely buries itself, if it is not removed in time. Different persons recommend different remedies; the favourite applications for the West Indies seem to be oily or greasy substances, rum, bay rum and lime juice. Any ointment containing sulphur would also be useful. It must be remembered, however, that to be really efficacious, these remedies should be applied as soon as possible after the attack begins, for if the mites once become embedded in the skin, the remedies do not reach them, and the irritation and annoyance caused by the presence of these foreign bodies is extreme.



TRINIDAD: BOARD OF AGRICULTURE. ANNUAL REPORT OF THE MYCOLOGIST, 1909-10.

This report contains much interesting information with regard to diseases of the principal crops in Trinidad, arrived at as a result of Mr. Rorer's first year of work in that island. The plants dealt with include cacao, sugar-cane, cocoa-nut palms, and bananas, in addition to several of minor importance.

The work on cacao consisted of cultural and inoculation experiments with the black rot fungus (*Phytophthora omnivora*) and various species of Nectria. As a result of these experiments, it was shown that cacao canker, as well as black rot of the pods, is due to the first-mentioned fungus, and that infection may spread from the pods to the cushion and bark, and vice versa. A fuller paper dealing with this point is to be published later. Some investigation of minor diseases such as die back, thread blight and root disease, was also made, and material suspected of exhibiting the characters of the witches' broom disease of Surinam was carefully examined, with the result that it appears unlikely that this disease occurs in Trinidad. Careful spraying experiments on cacao were carried out in September and December of last year, and in February of this year, as a result of which Mr. Rorer is able to state that spraying, if thoroughly conducted, pays; for it not only naturally increases the number of healthy pods, but also prevents loss of trees from canker, by checking the spread of the black rot fungus on the pods, and from these to the tree itself. It also has a beneficial effect in keeping the minor diseases in check. A paper dealing fully with the results so far attained is to be issued later, and should prove of great interest.

As a result of the field examination of sugar-cane, Mr. Rorer states that the root disease and the blight are not connected with one another, as one may occur without the other, though both are sometimes found in the same field. A fungus, identified by Massee as *Septocylindrium suspectum*, was found on dead adult frog hoppers and may prove to be of economic importance if it is capable of causing disease of living insects. (See *Kew Bulletin*, 1910, No. 1.)

Bud rot and root disease are the most serious diseases of cocoa-nuts in Trinidad, though their causes or cause are not yet definitely determined. It is suspected that some connexion may exist between them: that both are due possibly to the same organism. The only method of dealing with them is thoroughly to destroy infected trees, and for this purpose a sum of \$375 has been so far expended on work under the direction of an inspector. Mr. Rorer recommends that the sum of \$500, originally voted, should be voted again, and that the work should be continued next year, when he also proposes to make a more thorough investigation of the diseases. Other cocoa-nut diseases are bleeding disease of the stem, due to *Thielaviopsis ethaceticus*, and leaf disease, in addition to one known as 'little leaf disease', the cause of which is not understood.

Three banana diseases are reported: the Panama disease, possibly due to a species of Fusarium; the Moko disease, shown by Mr. Rorer to be bacterial in origin; and a root disease, caused by a species of Marasmius, which is probably that known as *Marasmius semiustus*.

Anthracnose of mangos, due to *Gloeosporium mangiferae*, was of rather common occurrence. The fungus attacks the flowers and leaves, as well as the fruit. If this fruit and the avocado pear are to be grown for export, on any industrial scale, a policy of thorough spraying will have to be adopted. Leaf spot disease of cassava, leaf mould of tomatos due to *Cladosporium fulvum*, and rose mildew are also mentioned, but were controlled on a small scale by spraying. Weak lime sulphur mixture is recommended for roses, and Bordeaux mixture for tomatos.

As will be seen, the report contains much valuable information. Some of it has already appeared in the *Bulletin of the Department of Agriculture*, Trinidad, and part of this will be incorporated into suitable articles under the heading of Fungus Notes, so as to render more details available to readers of the *Agricultural News*. Meanwhile, further results obtained from continuation of the work already begun, especially the cacao spraying experiments, will be awaited with interest.

SUITABLE MANURES FOR MAIZE.

The Bureau of Soils of the United States Department of Agriculture has just issued Bulletin 64, entitled *Fertilizers for Corn Soils*, in which the following summary of conclusions in regard to the subject is given:—

The experiment stations have reported the results of 6,394 tests with fertilizers on corn soils.

Duplicate control plots show such variations, and the range of crop increases due to fertilizers is so wide, that considerable latitude must be allowed in the interpretation of all results, and quantitative comparisons should not be given too great weight.

The chances for increased yields, and the actual increases, are greater with two or three materials mixed, than with single fertilizers.

Increasing the amount of any single fertilizer from 1 to 10 times does not appear to have any significant effect upon the increased yield obtained from the smaller amounts, applied within the limits of the experiments.

From the records, fertilizers appear to have yielded, on the average, about the same increase in the crop on the more productive and on the less productive soils.

In the great majority of cases, and on the average, the increase of product due to the use of fertilizers on corn soils does not appear to be equal to the cost of the fertilizers used to produce the increase. The average cost of the fertilizers used in all experiments was \$7·06 per acre, the average increase in crop was 9·2 bushels of shelled corn worth, at 60 cents per bushel, \$5·52 indicating a net average loss of \$1·42 per acre.

It would appear that much yet remains to be determined as to how fertilizers act, before a rational and economical fertilizer practice can be worked out.

As these results have been obtained from a large number of soils, with a considerable range of productivity, over a number of years, these general conclusions, besides others of a qualitative value which can be drawn from the tables, can, in the absence of any more specific knowledge of any particular soil, be safely followed as a guide to the immediate selection of fertilizers for a corn soil.

GLEANINGS.

With reference to the useful series of articles that are appearing in the *West India Committee Circular*, entitled 'Cacao', by Mr. J. H. Hart, F.L.S., it is stated that there is an intention to publish these in book form, when they are completed.

Information has been received from Mr. F. Potter of Goodwill estate, Dominica, that he has certain sugar machinery for sale. Some particulars of this will be found in an advertisement on page 4 of the cover of this issue of the *Agricultural News*.

The Antigua *Sun* of Monday, May 23, gives an account of an address delivered in that island on May 18, by Mr. A. St. G. Spooner, of Bendals estate, dealing with the question as to whether central factories are beneficial or otherwise, in relation to Antigua.

The examination results in the School of Agriculture at Macdonald College (Mc Gill University), published recently, show that Mr. J. S. Dash, late of the Barbados Agricultural Department, took the first place in Class I, General Proficiency, for the First Year Course.

In 1909, the maize exported from South Africa to England was worth £665,596; in 1908, its value was £217,718. The conditions for maize-growing in South Africa should make the importance of this plant in that country greater year by year.

The report of the Agricultural Instructor, Nevis, for May 1910, shows that there has been a prolonged drought in that island, which, if it continues, will seriously interfere with the agricultural prospects of the island, and may even prevent the realization of the sugar crop next year.

The *Proceedings of the Agricultural Society of Trinidad and Tobago*, for May 1910, shows that 7,009,896 ℔. of cacao was shipped from Trinidad during that month. The total amount exported, from January 1, to the end of May 1910, was 32,507,935 ℔. The similar figures for 1909 and 1908 were 29,618,547 ℔. and 26,642,905 ℔., respectively.

In the *Monthly Consular and Trade Reports*, for March 1910, it is stated that recent experiments in Trinidad have proved that the wood yielded by pois doux (*Inga laurina*) can be used successfully in the manufacture of rum puncheons, in competition with imported wood. It is specially suitable because it does not impart any flavour or colour whatever to the liquor in the puncheons. This would seem to suggest a use for wood of this kind from Dominica, where it is common.

The output of cocoanut oil in Ceylon for the first quarter of the present year was 98,514 cwt., against 84,621 cwt., for a like period in 1909. The similar figures for copra and decorticated nuts were respectively 134,302 cwt., and 119,873 cwt., and 4,741,751 ℔. against 4,910,386 ℔, (The *Tropical Agriculturist*, April 1910.)

According to the report of the Agricultural Instructor, Tortola, for last April, the cotton crop in the Virgin Islands had been almost completed at that time, and the increasing interest showed that a much greater area would be sown for the coming season. A new cane mill has been imported for the purpose of dealing with peasant canes, which are bought on a basis of 4 ℔. sugar for 100 ℔. cane.

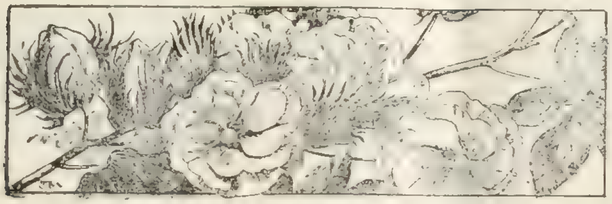
In the three great rice-producing States of Brazil, namely Minas Geraes, Rio de Janeiro and São Paulo, great progress has been made in the cultivation of this plant. From 1897 to 1904, the average annual export of rice from the first-mentioned State to other parts of Brazil was 1,068,228 ℔; in 1905, it had increased to 1,951,494 ℔.; and in 1906 and 1907, to 9,069,958 ℔. and 18,168,665 ℔., respectively. (The *Board of Trade Journal*, June 2, 1910.)

With reference to the statement on page 182 of this volume of the *Agricultural News*, that excellent prices and yield of cotton have been obtained for the past crop by at least two growers in Antigua, it is interesting to note that one of these raised a considerable proportion of the crop from seed produced at Rooms estate by the late owner, Mr. J. H. Lee, from plants arising from a single cotton plant selected by the Local Agricultural Department.

The Turkish Government has appointed a Commission to consider the question of which parts of the Ottoman Empire are best suited for cotton-growing. Syria, Mesopotamia and Macedonia, at present, grow a certain amount of cotton, the latter country producing about 6,500 bales last year. This quantity is not enough to supply the needs of the South Macedonian mills, which, with a total of 51,000 spindles, consumed 11,100 bales. (The *Textile Mercury*, June 4, 1910.)

The *Experiment Station Record* of the United States Department of Agriculture, for April 1910, p. 438, gives the result of investigations that have been made on the occurrence of phosphric acid in the leaves of various plants at different stages of growth. It was found that, generally, the phosphorus content of the leaves became greatest at the period of greatest growth, after which there was a steady decrease until autumn. Red leaves were found to contain less phosphorus than green ones, from the same plant.

In regard to the forthcoming International Rubber and Allied Trades Exhibition, mention of which has been in the *Agricultural News*, Vol. IX, pp. 60, 156 and 172, information has been received from the organizing manager, Mr. A. Staines Manders, that the Rubber Growers' Association, London, has decided to present the committee of the exhibition with three medals (gold, silver and bronze) for the best exhibits of certain kinds of crude rubber; full particulars will be published soon. In addition, the *India Rubber Journal* (London) is presenting a shield valued at 100 guineas for the best exhibit of plantation Para rubber, the conditions of competition for which will be issued shortly.



STUDENTS' CORNER.

JULY.

SECOND PERIOD.

Seasonal Notes.

At the present time, the cane grower will have his attention directed more particularly to the subject of ratoons, as the canes of last season's crop will have been taken off, in most places. Read what is said in the first paragraph of the Seasonal Notes for the first period of June (*Agricultural News*, Vol. IX, p. 173), and either commence or continue the observations that are indicated there. Ratoon canes do not usually grow as large as plant canes. Can you suggest any reason, or reasons, for this? Where it is possible, an interesting investigation may be made, in the following way. Compare the average amounts of sugar obtained per acre, on the estate, from plants and first ratoons, and see what relation the smaller expense, in labour and cultivation, for ratoons than for canes, bears to the monetary value of the additional amount of sugar that has been obtained, per acre, from plant canes. How do the advantages, or disadvantages of several years of ratooning compare between a large owner, with plenty of capital, and a small proprietor, with little or no capital? Discuss the importance of considerations in regard to loss by disease, in this connexion.

Examine the ground vegetation in lime plantations, and try to find out if the different kinds of weeds give any indication as to the kind or state of the soil beneath them. Useful indications as to the necessity for better drainage may be often obtained by making observations of this kind. Where green dressings have been grown between lime trees and then buried in the soil, it will most probably be noticed that the leaves of these plants are greener, and that the latter look healthier, altogether, than where this has not been done. How may this improvement be explained? Examine several lime trees, in order to find out on what part of them the fruit is chiefly borne. It will generally be found that the healthy trees produce fruit not only on and near the outside of the tree, that is at and near the ends of the main branches, but also near the middle of it.

The experience that has been gained, and the observations made in the past, should have enabled a decision to have been formed as to the green dressings that are most suitable for growing in the neighbourhood where the student lives. Give an account of as many of the following plants as you can: alfalfa, Barbuda bean, Bengal bean, cow pea, horse bean, pigeon pea and woolly pyrol, with especial reference to: (1) time required to grow and form seed; (2) liability to be attacked by insects; (3) ability to cover the ground; (4) amount of seed formed; and (5) suitability for being cut and buried. Which of these are not liable to be attacked by caterpillers, and what property do those possess, which protects them from these pests? It is often found that, when attempts are made to raise a leguminous crop on a soil where that plant has not been sown before, it makes very poor growth for the first few crops, but that by sowing it there several times, it can be made to flourish, after a time, and produce good harvests. What explanation is there, of this fact? What indications does such a consideration give in relation to the usefulness, or otherwise, of soil inoculation: (1) where a given leguminous plant has been grown; (2) where this is not the case, and where it is intended to introduce the plant?

What do you know about the conditions under which the characters of definite varieties of cotton plants may change? Discuss the importance of the considerations mentioned by you, in relation to the policy of endeavouring to select, for each island, a strain of cotton which is best suited to the conditions in that island. Should this principle be applied in a narrower way, so as to enable strains to be obtained which are suited particularly to definite districts? How is selection of this kind performed? What is the difference between selection and breeding? Why are the methods used in breeding cotton quite different from those that are employed for a plant such as corn (maize)?

In planting yams, eddos and sweet potatos, the varieties put in should naturally be those which are most suitable to the district in which they are being grown. Useful information, in connexion with this, will be found in many of the Botanic and Experiment Station Reports that are issued annually by the Department. When the tubers of yams and eddos are examined carefully, they are often seen to be attacked by scale insects, and it is evident that these pests are causing a certain amount of injury to them. How is this injury effected? State what treatment should be given to such infested tubers before they are planted. Mention other plants that are attacked by scale insects on the parts that are below the surface of the soil. Give an account of methods for the control of scale insects that live on the parts of plants in the ground.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by a hybrid plant? Describe a simple way of obtaining hybrid plants, and state how they arise as the result of such an operation.

(2) What are (a) nitrate of soda, (b) sulphate of ammonia? What percentage of nitrogen should a commercial sample of each of these manures contain?

(3) Give an account of the structure of the cotton seed, and state the ways in which it differs from the seed of the ground nut, and from a grain of corn.

INTERMEDIATE QUESTIONS.

(1) Describe what you consider to be the best conditions for the cultivation of limes, giving reasons for your conclusions.

(2) What grasses, or mixtures of grasses, are best suited for each of the following: (a) pastures, (b) the production of hay?

(3) What is meant by 'soil sickness'? How can this condition be rectified?

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Tuesday, July 5, by the R.M.S. 'Berbice', on an official visit to the Leeward Islands.

FUNGUS NOTES.

CACAO CANKER.

The canker disease of cacao has long been known from all parts of the tropical world where this plant is cultivated, and many different investigators have attempted to determine its cause, and to suggest remedial and preventive measures for combating it. While successful to a very considerable extent in regard to methods of treatment, none of the earlier investigators can be said to have definitely determined the fungus to which the disease is primarily due. At first sight, it may appear that this last is a point of interest only to the mycologist, and not of any importance to the practical man. Actually, this is very far from being the case as, it is hoped, will be clearly indicated in the sequel. Apart from other considerations, the definite determination of the fungus to which any given disease is due is of practical importance because, until this has been done, the biology, or life-history, of that fungus cannot be worked out, and without a thorough knowledge of its different forms, its general habits, and its method of attack, the best remedial and preventive measures cannot be determined. Such a knowledge of the parasite is also of importance, as it shows at once whether the fungus is one not known to occur on any other plants common to the locality, or even on other parts of the same host plant, or whether it is identical with some species already well known.

Until very recently, canker of cacao has been attributed to various species of Nectria, or closely allied genera, the actual species varying somewhat with the part of the world from which the disease was reported. Recently, however, considerable doubt has been thrown on these conclusions by two or three investigators. Mrs. van Hall, in Surinam, has isolated a fungus from cankered areas on cacao, to which she gave the name *Spicaria colorans*. (*Agricultural News*, Vol. IX, p. 46.) This fungus differed from the species of Nectria usually found associated with it, in that it only produced two conidial forms of spores, and never gave rise to any perithecial stage. As a result of a critical examination of the literature of the subject, Mrs. van Hall comes to the conclusion that in no single instance has it been satisfactorily shown that canker of cacao is due to a species of Nectria, and consequently these fungi must be regarded as entirely saprophytic in nature. She admits, however, that the fungus *Spicaria colorans*, isolated and investigated by herself, would not infect healthy trees, even when inserted in wounds. She suggests nevertheless, that the fungus may only be able to attack the trees when they are in an unhealthy state.

More recently, Mr. J. B. Rorer, Mycologist to the Board of Agriculture in Trinidad, has been conducting an investigation of this disease, and a preliminary account of his results appears in a paper published in the *Bulletin of the Department of Agriculture*, Trinidad, Vol. IX, No. 64. A more detailed account is to appear shortly.

Mr. Rorer was led to suspect that canker might be due to the fungus which causes black rot of the pods, *Phytophthora omnivora*, and consequently determined to try the results of inoculating pods and bark with pure cultures of the fungus. As a result of these experiments, he found that the fungus could spread backward from the pod, up the stalk, into the cushion, and cause the typical symptoms of canker in the bark near the cushion. Inoculations made in the bark invariably produced the cankered appearance, and those made in the bark, about 2 inches, or an inch, from the pod, resulted in the appearance of black rot on the pod. These experiments seem to indicate definitely that, in Trinidad, canker of cacao is due to the same fungus as causes the black rot of the pods. This is supported by the fact that *Phytophthora omnivora* could always be obtained again from the infected areas, and from areas affected with canker. Petch, in Ceylon, has obtained results which support Rorer's conclusions, so that it seems necessary that a thorough reinvestigation of the disease in all countries where it is known should be undertaken. Rorer supports Mrs. van Hall's conclusions that the species of *Nectria* usually found on cacao are all saprophytic, as inoculation experiments with various species of this genus were all failures. Howard, however, was able to produce infection, through wounds, with spores of *Nectria theobromae* and *Calonectria flavida*, so that Rorer's results cannot be definitely adopted as being true for the form of canker which occurs in Dominica, Grenada, St. Lucia and St. Vincent until further experiments to settle this point have been made.

Some interesting preliminary observations in connexion with this point have been supplied by Mr. Jones, Curator of the Botanic Station, Dominica, in reply to enquiries from the Head Office of the Department. It was noticed that a plot of grafted Alligator cacao (*Theobroma pentagona*) on the Calabacillo variety as a stock, was especially prone to attacks of canker, which spread down the scion to the junction with the stock, after which it rapidly ringed the scion without attacking the stock. (*West Indian Bulletin*, Vol. X, p. 341.) A preliminary examination showed the presence of the usual *Fusarium* pustules on the bark, but it seemed possible that the disease might be due to *Phytophthora omnivora*, and consequently information with regard to certain points was requested. The reply revealed the fact that the trees were from three years to four years and nine months old, and had borne well. No canker had appeared until the trees began to bear, and in Mr. Jones's experience, even the most delicate varieties of cacao do not become subject to canker until after they have commenced to fruit. Specimens of diseased pods from the Alligator cacao trees were forwarded to the Head Office of the Department for examination, and were found to be badly infected with the black rot disease. The disease is stated to be common on the pods of Alligator cacao trees suffering from canker, and also appears on pods of trees which are commencing to bear. These observations, at any rate, suggest that, as in Trinidad, the canker disease on Alligator cacao in Dominica is due to *Phytophthora omnivora*. Further observations and experiments in this connexion will be undertaken as opportunity offers.

Another point of interest in relation to this disease is also provided by Mr. Jones: that is, the relative immunity to the disease of different varieties of cacao. It has been found that the Criollo and Alligator cacaos are especially prone to attacks of canker, and, even when the diseased areas are excised and tarred in the usual way, are unable to recover, or to form new bark over the wound. Moreover, they are equally prone to attack either in wet or dry localities. The Forastero variety is liable to attacks of this disease, but responds to the usual remedial measures, and the Calabacillo variety is not known to be affected at all, in Dominica.

Rorer has been lately conducting experiments on spraying cacao in Trinidad with Bordeaux mixture. An account of his results will appear in the next number of the *Agricultural News*. He came to the conclusion that this treatment was thoroughly practical and remunerative, and especially to be advocated, in order to prevent the spread of the black rot fungus from the pods to the trees, thus reducing the general prevalence of canker. Should the same fungus be responsible

for canker in the other West Indian Islands, it is at any rate evident that every possible means for the suppression of black rot should be undertaken, and that where the nature of the ground permits, spraying with Bordeaux mixture on a large scale may even be found remunerative. Another preventive measure is to plant only those varieties of cacao which are reasonably resistent to the disease. These preventive measures, taken in connexion with the remedial measures already in practice, should prove capable of reducing the prevalence of the disease to a minimum Even if canker disease is not always due to *Phytophthora omnivora*, but is in reality attributable to *Spicaria colorans*, or some species of *Nectria* in certain instances, yet the practicability of spraying with Bordeaux mixture is worthy of consideration, as it would certainly tend to reduce canker, in addition to attaining its main object, namely, the reduction of pod diseases.

GERMINATION AND FERTILITY OF POLLEN.

The fourth of the Research Bulletins that are being issued by the University of Wisconsin has the title *Some Conditions which Influence the Germination and Fertility of Pollen.* The following information is taken from the conclusions that were reached, on the completion of the work described in the bulletin:—

(1) The germination and subsequent growth of the pollen tube are very similar to the germination of ordinary spores, and the growth of the hyphal thread. The changes taking place in the pollen grain previous to the germination are undoubtedly similar to those that take place in the germination of the seed, and the necessary conditions for germination of the pollen grain are the same, that is, heat, moisture, oxygen and a suitable medium.

(2) The first noticeable change is the swelling of the grain, due to the imbibition of water, and the rate of imbibition depends on the temperature, concentration of the culture media, and in some cases upon sunshine. The greater the concentration, the less rapid is the imbibition and germination. In these experiments, the presence of diastase and invertase has been confirmed both in the pollen grains and in the tissues of the style and stigma.

(3) Most pollen grains will germinate in a solution of cane sugar. The degree of concentration differs with the different species of plants. It is possible that the degree of concentration of the medium in which the pollen of different species are capable of germinating and growing may, to some extent, be a barrier against promiscuous cross-fertilization in nature and horticultural practice. However, in most cases, the range is sufficiently great to overcome these obstacles, if there were not other difficulties in the way.

(4) No definite statement can be made as to the exact manner of growth of the pollen tube. The movement of reserve food from the pollen grain down to the tube was clearly noticeable, but it cannot be stated whether the fecundating nucleus, which appears at the end of the pollen tube when it has reached its maximum growth, migrated from the pollen grain or was in the pollen tube. The limitation to the growth in length of a given species of pollen may be, and undoubtedly is, a barrier against cross-pollination of relative species and varieties.

(5) The vitality of pollen is not seriously affected by temperatures raging from 25° to 55°C. in a dry atmosphere. Temperatures under 25° seriously interfere with the germination. A temperature from 70° to 80° C., in a saturated atmosphere, is fatal to the pollen of the peach, apple and plum. At a temperature of 40° to 50°C., in a saturated atmosphere, the grains burst open on account of the rapid imbibition of water, and the number of burst grains increased with the temperature.

(6) Sunshine had little or no effect on the germination of pollen, or upon the growth of the pollen tube, in most plants. There was, however, a slight increase in the rate of growth in favour of sunshine. The germination and growth of the pollen of the tomato are decidedly retarded by cloudy weather, and also the anthers of the tomato require a certain amount of sunshine for the proper development of the pollen. The same is true in several species of Lilium.

(7) The lack of cultivation and fertility in orchards greatly injures the production and fertility of pollen.

(8) Pollen may safely be shipped from one part of the country to another without losing viability or fertility.

(9) Experiments indicate that the length of time required for the germination is considerably less than is commonly believed. Two or three bright, warm days, at the time of full bloom, are sufficient for the setting of the fruit. The stigmas of the apple are receptive from four to six days, whether pollinated or not. Continuous rainy weather for six days would probably result in total failure of the crop.

(10) The factors which affect the fertility and production of pollen, over which the orchardist has control, may be briefly stated as follows: suitable site, location and soil; proper planting, cultivation, and sufficient amount of plant food; pruning and spraying; selection of suitable varieties propagated from bearing trees; and the planting of several varieties which flower at about the same time, to insure proper fertilization.

(11) The factors over which the orchardist has little or no control are: freezing temperature, which may kill the pistil or the pollen, especially before the latter is ripe, or both; continuous rain during full bloom of the orchard; high temperature with a large amount of moisture, and absence of wind, which causes much pollen to burst at the time of germination; and absence of insects and wind at the time of full bloom.

The Care of Pastures.—Attention has been given recently to the condition of pastures, in Eastern New York and the New England States, by the Bureau of Plant Industry of the United States Department of Agriculture, and the results of the work that has been done are presented in Circular No. 49 of that bureau. Some of these are of more general interest, and may be given as follows: (1) In the corn belt, the practice is to build up badly worn land by using it as a pasture for cattle, whereas the treatment that has been received by pastures in Eastern New York and the New England States has caused them to deteriorate greatly; (2) grazing too early, and too close grazing, are harmful, the latter, because the plants are left without sufficient leaf surface for nutrition and because it allows dangerous weeds to become established; (3) remedial measures for worn out pastures consist in: the prevention of over-grazing, the prevention of too early grazing, manuring, cultivating, re-sowing and the eradication of weeds.

MARKET REPORTS.

London,—THE WEST INDIA COMMITTEE CIRCULAR, June 7, 1910; Messrs. E. A. DE PASS & Co., May 27, 1910.

ARROWROOT—St. Vincent, 1$\frac{3}{4}$*d.* to 3$\frac{3}{4}$*d.*
BALATA—Sheet, 4/3; block, 3/7 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 52/- to 60/- per cwt.; Grenada, 48/- to 53/6, Jamaica, 44/- to 52/6.
COFFEE—Jamaica, 43/- to 57/-.
COPRA—West Indian, £27 to £27 5*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 21$\frac{1}{2}$*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 59/-; good bright to fine, 60/- to 70/-.
HONEY—31/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/1; concentrated, £18 10*s.* to £18 15*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, 2$\frac{1}{8}$*d.*; fair, 2$\frac{3}{16}$*d.*; good, 2$\frac{1}{4}$*d.* per lb.
RUBBER—Para, fine hard, 9/4, fine soft, 9/3; fine Peru, 9/2 per lb.
RUM—Jamaica, 2/- to 5/-.
SUGAR—Crystals, 18/- to 21/; Muscovado, 14/- to 15/; Syrup, 12/6 to 15/3; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., June 10, 1910.

CACAO—Caracas, 11c. to 11$\frac{1}{4}$c.; Grenada, 10$\frac{7}{8}$c. to 11$\frac{1}{4}$c.; Trinidad, 11c. to 11$\frac{1}{2}$c.; Jamaica, 9c. to 10c. per lb.
COCOA-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$15·00 to \$16·00; Trinidad, select, \$25·00 to \$26·00; culls, \$15·00 to \$16·00 per M.
COFFEE—Jamaica, ordinary, 8$\frac{1}{2}$c. to 8$\frac{3}{4}$c.; good ordinary, 9c. to 9$\frac{1}{2}$c.; and washed, up to 11c. per lb.
GINGER—9$\frac{1}{2}$c. to 12$\frac{1}{2}$c. per lb.
GOAT SKINS—Jamaica, 55c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—\$3·00 to \$4·00 per box.
LIMES—\$5·00 to \$6·00.
MACE—29c. to 36$\frac{1}{2}$c. per lb.
NUTMEGS—110's, 8$\frac{3}{4}$c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4$\frac{1}{4}$c. to 4$\frac{3}{8}$c. per lb.
SUGAR—Centrifugals, 96°, 4·24c. per lb.; Muscovados, 89°, 3·74c.; Molasses, 89°, 3·49c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., June 25, 1910.

CACAO—Venezuelan, \$11·40 per fanega; Trinidad, \$10·90 to \$11·25.
COCOA-NUT OIL—\$1·09 per Imperial gallon.
COFFEE—Venezuelan, 10$\frac{3}{4}$c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—No quotations.
ONIONS—\$2·50 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·00 to \$6·10 per bag.
POTATOS—English, \$1·50 to \$1·75 per 100 lb.
RICE—Yellow, \$4·45 to \$4·50; White, \$5·00 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., July 4, 1910; Messrs. T. S. GARRAWAY & Co., July 5, 1910; Messrs. JAMES A. LYNCH & Co., June 27, 1910.

ARROWROOT—St. Vincent, \$3·50 to \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$18·00.
COFFEE—Jamaica and ordinary Rio, \$9·50 to \$11·00 per 100 lb., scarce.
HAY—\$1·20 to \$1·40 per 100 lb., dull.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·00 to \$2·50 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·25 per bag of 210 lb.; Canada, \$3·45 to \$3·50 per bag of 120 lb.
POTATOS—Nova Scotia, \$1·92 to \$3·00 per 160 lb.
RICE—Ballam, \$4·58 to \$4·90 (180 lb.); Patna, \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, June 25, 1910; Messrs. SANDBACH, PARKER & Co., June 24, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·00 per 200 lb.	\$8·00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c to 13c. per lb.
Jamaica and Rio	14$\frac{1}{2}$c. per lb.	14$\frac{1}{2}$c. to 15c. per lb.
Liberian	8$\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$4·00 to \$4·10 per bag of 168 lb.	\$4·00 to \$4·10 per bag of 168 lb.
Green Dhal	\$5·25	——
EDDOS—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	3c. to 3$\frac{1}{4}$c.	3c. to 3$\frac{1}{4}$c.
Madeira	——	No quotation
PEAS—Split	\$5·75 to \$5·80 per bag (210 lb.)	\$5·80 to \$5·85 per bag (210 lb.)
Marseilles	\$4·00	No quotation
PLANTAINS—	12c. to 70c. per bunch	——
POTATOS—Nova Scotia	\$2·50 to \$2·75	\$2·75
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	\$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·50	\$5·00 to \$5·50
TANNIAS—	\$1·68 per bag	——
YAMS—White	\$2·16	——
Buck	\$3·50	——
SUGAR—Dark crystals	\$3·00 to \$3·10	None
Yellow	\$3·70 to \$3·80	\$3·60
White	\$4·00	\$4·00
Molasses	\$2·25 to \$2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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OF THE
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CONTENTS.

Some Considerations in the Treatment of Plant Diseases.

ONE of the most important considerations which enter into the treatment of plant diseases is the relation between the expense it involves and the return in additional profit which it is likely to yield. This relation is often dependent on several factors of a purely local nature, so that the correct solution of the problem, in any given instance, depends on useful co-operation between the planter and his advisers. It is with the object of indicating in what ways this co-operation is specially important that the following matters are brought under discussion.

When any crop is attacked by disease of a fungoid origin, the nature of such attack may be of two kinds: either it may be epidemic and destroy, or threaten to destroy, the whole crop in the course of a short space of time, or it may cause the steady loss of a certain percentage of the produce during a long period; that is, it may be endemic. In the second case, there is always to be taken into consideration the additional danger of such diseases becoming suddenly epidemic.

The general nature of the advice given by a plant pathologist, or mycologist in dealing with disease falls underthree heads. Firstly, total destruction of the diseased plants; secondly, the application of remedial and preventive measures to diseased plants or to plants likely to become diseased; thirdly, permitting the disease to take its course unchecked. The first two kinds of advice may be given in dealing with either epidemic or endemic diseases. The third is only applicable in the case of such endemic diseases as do so little harm that the expense involved in checking them is not compensated for by the additional profits obtainable from the crop.

In the case of the sudden outbreak of an epidemic on any estate, the best advice that can be given is frequently for the total destruction of the infected plants, as, although it necessarily involves a certain amount of loss, yet if the trouble is treated at an early stage, this loss is not serious in proportion to that which would be sustained if the whole crop was destroyed. In this

case, the sacrifice of a portion of the crop is not only justified, but often absolutely necessary, in order to prevent the loss of the whole. Remedial, followed by preventive measures, or remedial measures alone, can only be recommended in such a case, when the result of long experience has proved conclusively that these measures are adequate to prevent the spread of the disease.

The treatment of endemic disease is of a different nature. In this case, there is often little risk of the total loss of a crop, or even of the loss of so great a part of it as takes away all profit from the grower. Most frequently, the main object is to reduce the percentage of loss due to the disease to a minimum, and thus to increase the profits to the maximum obtainable in the conditions under consideration. Then it is that remedial and preventive measures become of the first importance. Total destruction can be but rarely recommended, because it certainly involves the loss of part of the crop, and possibly, that of part of the capital expended on removing dead trees and on replanting others which often give no return for five or six years; moreover endemic diseases are apt to affect, to a greater or smaller extent, almost every tree or plant on any plantation where they occur. The position of the mycologist in this case would appear to be a very simple one. In reality this is not so. In recommending remedial and preventive measures, he has to consider if the expense involved will gain adequate compensation in the additional profits derivable from the treatment. If not, then all he can say is that the existing state of things must be permitted to continue, and in so doing, he allows the planter to run the possible risk of the endemic disease becoming epidemic, and causing the loss of all his plants.

The conditions which determine if the expense involved in remedial measures is justified by the additional profits obtained are often governed by the interaction of numerous, and somewhat delicate, factors. Such are, for example, the general circumstances of climate, the fertility of the soil, its suitability to the crop grown, and the amount of co-operative effort to reduce the disease that is likely to occur in the neighbourhood under consideration.

In recommending remedial measures, two other important factors must be taken into account, namely, the amount of capital available for carrying them out, and, if carried out, their cumulative effect on the suppression of the disease. Frequently, the execution of the best remedial measures, in any given case, involves the outlay of a certain amount of capital, and where this is not available, less effective, though frequently much cheaper, measures must be recommended. Consequently, it often happens that two or three alternative sets of treatment have to be suggested, while the choice of that set which is most applicable in any case, is left to the person who is raising the crop. In some instances, where there is little or no available capital, as in the case of small holders, all that can be suggested by the scientific adviser may be that the disease be permitted to exact an annual toll, as long as this toll does not involve all, or the greater portion, of the profits. On the other hand, those possessed of spare capital should bear in mind that the investment of it in thorough and reliable treatment of their crops will often yield a larger return of interest than the money could ever bring in if it was invested in ordinary securities, though the risk involved is necessarily somewhat greater. Further, money thus spent not only increases the yield in any given year, but, if the treatment is continued, earns as it were a higher rate of interest each year, until a steady maximum is reached, owing to the cumulative effect of the treatment on the suppression of the disease, which suppression continues until the loss due to the disease reaches the minimum that can be effected by that treatment under the given circumstances. Now, it often happens that a grower desires to increase his annual output of produce, and in order to do so, invests additional capital in new land; if, however, he were to invest this capital in carefully carrying out approved measures for reducing the diseases of his crop, he would probably find that his yield would increase to such an extent that the interest on his capital when expended in this way was greater than that which he would have obtained had he invested his money in more land.

It will probably be clear now, that it is not always an easy matter for the scientific adviser to make suggestions as to the best treatment for any given disease. In addition to the technical difficulties of his work, many considerations of a very varied nature must also be taken into account, and it is in dealing with these that the co-operation of the practical agriculturist is of the greatest service. Frequently, portions of the diseased material are submitted, for examination by the pathologist, which are forwarded almost without any word of explanation. No information is given with regard to the field characters of the disease, its extent, and the general conditions which may affect it; and no hint is afforded as to the amount that the planter is prepared to expend in controlling it. When this is the case, the work of the mycologist is

rendered considerably more difficult, and it can hardly be a matter for wonder that his advice is sometimes not directly suited to the requirements of the agriculturist. Too much emphasis cannot be laid on the importance of forwarding, with all specimens for examination, the fullest possible account of all circumstances, however trivial, that may shed any light on the problem, as in this way only, can a full and sympathetic understanding of any given case be arrived at, by his advisers, which will enable the practical agriculturist to be in receipt of the best and most carefully considered recommendations.

THE MANUFACTURE OF WHITE SUGAR IN JAVA.

An article with the above title, by H. C. Prinsen Geerligs, appears in the *International Sugar Journal* for June 1910 (Vol. XII, p. 285). The paper on which it is based was read at the Paris Congress, and in view of its interest, it is reproduced here.

The production of white plantation sugar, destined for direct consumption, has made enormous progress in Java during the past few years. It was only in 1903 that Java commenced to export to British India some thousands of tons of this sugar; but the quantity produced in 1905 was 70,000 tons, and in 1909 it reached 250,000; whilst now, many factories are adapting their plant for the future manufacture of the white product.

Java white sugar has already turned out all the German product on the Indian markets, and to a great extent all the Austrian sugar. Nevertheless, the production of yellow sugars has in no way suffered by the export of white, but has even increased. In 1900, Java produced 700,000 tons of refining sugar; in 1905, this increased to 900,000 tons, to amount to 1,000,000 tons in the past year. Whilst almost all the factories have augmented their production, new ones have also been constructed, with the result that the production of the island has tripled during the past twenty years. In 1890, the white sugar produced was only ½ per cent. of the total turn-out, but now it has risen to almost 20 per cent. of the total production.

This white plantation sugar is made without refining, and without the use of animal charcoal. Since it is to be consumed in India, it must be free from contamination from animal matter, this being prohibited by the Hindus by reason of their religious sentiments. Moreover, this sugar is not very white, and it is not to be compared to the white product; but its buyers appreciate it, as its increasing consumption fully testifies.

The first factories taking up the manufacture of white sugar in Java were specially equipped for the purpose. They had carbonatation tanks, lime kilns, and indeed all the machinery for clarifying and purifying the juice by the double carbonatation process. This method, although it gives a white sugar of excellent quality, which behaves very well in the tropics during storage and transportation, is very costly to make by reason of the expense of the limestone, of the coke, and of the labour necessary for working the kilns. Further, since carbonatation makes the juice very bright, it is impossible to turn out a refining sugar suitable for export to the United States and to Japan. In these two countries the Customs duties are higher for a sugar light in colour than one that is darker, so that the buyer demands a dark sugar with a high polarization.

These two requirements may be satisfied by clarifying the juice by ordinary defecation without filtration, but not by clarifying by double carbonatation with filtration. It would therefore be necessary to choose the method to be adopted: whether all the factory is to be equipped for carbonatation, and white sugar only made; or whether the manufacture of the yellow sugar is to be continued, and the factory left as it is. Some have advocated the purification of the juice by a more effective method than carbonatation, and have advised the introduction of improvements in ordinary defecation so as to allow of the manufacture of a whiter product. Thus the Ranson system was tried, and since this did not give the desired satisfactory results, a number of other processes were taken up. The majority of these were worked secretly, but they have gradually been given up, until now the manufacture of sugar has entirely lost its mysterious aspect.

The method of working at present in vogue in Java is as follows: The mill juice is tempered in the cold with 15° Beaumé milk-of-lime at the rate of 5 to 6 litres for every 1,000 litres of the juice; then sulphur oven gases introduced until the reaction is just neutral, which point is determined by phenolphthalein paper. This neutralized juice is next passed through the juice heaters, where it is heated to boiling point, then into the defecators. After separating the impurities by decantation, the clear juice is conducted to the evaporators, whilst the subsided mud is sent through the filter-presses, and the resulting clear liquor united with that in the evaporators.

Then evaporation goes on until a density of 30° Brix is reached, after which boiling to grain follows, without any return of after-product. Sometimes the syrup is submitted to a second sulphuring until it is very slightly acid, but generally a simple decantation suffices. The massecuite is machined, without being cooled, in a series of centrifugals. The crystals obtained are not washed, but are taken out, mixed with syrup, and machined in a second series of centrifugals, being this time washed after all the covering syrup has been spun out. Finally, the sugar is dried by a jet of dry steam, discharged by the machines, allowed to cool in the air, sieved, and bagged.

The covering syrup is returned to the syrup tank to be subsequently drawn with the syrup into the pan. The centrifugalled molasses is diluted, sulphured, and boiled to grain; its massecuite is run into crystallizers-in-motion in which it is very slowly cooled, being diluted with water if it is not sufficiently limpid. When quite cool, it is centrifugalled without purging the sugar. The after-product obtained by this operation is an exhausted molasses, which is rejected; whilst the sugar, which contains a large amount of adhering molasses may be treated in different ways. Some sell it as molasses sugar; while others mix it with first jet massecuite in crystallizing tanks.

If the sugar obtained does not possess the desired whiteness, the syrup in the pan may be decolourized by means of hydrosulphite, and the sugar in the centrifugals be treated with a little ultramarine, to give it a better appearance.

The quality of the sugar produced by the method described does not at all differ from that obtained by carbonatation; it is just as white and preserves its colour as well, but sulphitation has the advantage of great simplicity.

All the plant for the manufacture of raw sugar may be retained, and it is only necessary to add a sulphur oven, the requisite piping, and a few centrifugals to make white sugar. Then, either white sugar or the raw product may be manufactured, according to the conditions obtaining on the market.

FRUITS AND FRUIT TREES.

PACKING AND TRANSPORTING CACAO PODS.

The following information as to the best methods of packing and transporting cacao pods is taken from the series of articles, entitled Cacao, by J. H Hart, F.L.S., which is appearing in the *West India Committee Circular*, the extract in this case being from pages 247 and 248 of the issue dated May 24, 1910, of that journal. Matter has been reproduced already, from these articles, in the *Agricultural News*, Vol. VIII, pp. 260, 292 and 340; and Vol. IX, p. 148:—

Cacao pods (each containing thirty to thirty-five seeds) can be forwarded long distances safely if sufficient care is used in picking, curing, and packing. It is, however, not advisable to send them on journeys longer than fourteen to sixteen days; they have reached safely in journeys taking as much as twenty to twenty-five days, but the risk of loss is too great. It is of essential importance in forwarding pods that they should not be damaged in the picking. Every one of them should be hand-picked and not cut or bruised in any way, or they will not go safely even with the best package, as they rot as quickly as an apple, when injured. The pods should be cured or wilted for a day or two in dry air before packing, and the packing should be carried out so as to afford ventilation and prevent heating or fermentation. This can best be done by packing them in shallow, well ventilated cases, in what is known as 'wood wool', or fine wood shavings, not sufficient, in any case, to gather heat and induce fermentation. Small quantities of seeds can also be transmitted by parcel post, in 1 and 2-lb biscuit tins, the seeds being packed in sterilized cocoa-nut refuse, but even these should not be sent except during warmest weather. The best cases for sending pods are shallow ones, 30 inches long, 1 foot deep and 18 inches or 2 feet wide. The ventilation apertures should be protected to prevent entrance of mice and rats, as the pods are tempting morsels for these rodents.

It will be gathered from the foregoing that the transport of cacao plants and seeds is not a specially difficult matter, if the principles which conduce to safe transport are fully known and observed. The ordinary planter is, as a rule, too much engaged in other duties and has too little transportation to attend to, to warrant the expenditure of time in undertaking practical work of this kind, and it cannot be expected that he will possess the experience which will ensure the regular success obtained by those who have been carrying on such work for a number of years. As a matter of fact, the transport of plants is a business or specialty, and the owner, company, or syndicate requiring seeds sent to long distances, cannot do better than obtain expert assistance and advice, this being cheaper in the end, rather than placing their reliance upon the best intentions of friends who are willing to assist them, but whose experience is not such as to conduce to a successful issue.

CACAO CULTIVATION IN THE GERMAN COLONIES.

The following is a translation of an article on the cultivation of cacao in the German colonies, which appears in *L'Agronomique Tropicale* for April 1910:—

The economic development of the German colonies, during the last few years has been rapidly extended, and is characterized notably by progress in agriculture in general, and especially in the growing of cotton, sisal, rubber and cacao. A recent number of *Gordian* (No. 14, 1909), gives, in this connexion, a review of the state of cacao cultivation in the German colonies, in 1907-8.

CAMEROONS. Here, cacao cultivation is chiefly in the hands of European companies. Measures have been taken to lessen the damage caused by a bark-boring beetle. The soil of the infested plantations was manured with superphosphate, and with chloride of potash, with the result that the yield was increased largely.

The first attempt at the cultivation of cacao by the natives has not been successful, as the Cameroon negro possesses a natural aversion for all innovations, and is not as capable of agricultural work as other natives, such as those of the Gold Coast, for example. The plantations have been completely abandoned, and are overrun by weeds. Perhaps a certain amount of improvement will be brought about, however, especially in the districts of Victoria and Bodiman, owing to the efforts of officers who give instruction to the natives, distribute seeds and young plants among them, and show them how the work should be done. Special attention has been given recently to teaching careful methods of preparing cacao, so that a product of good quality shall always

be obtained. In 1907-8, the area in cacao, in the Cameroons, was 7,674 hectares (1 hectare=2½ acres) of which 5,072 hectares were producing fully. The crop was 1,174 tons in 1906, 1,587 in 1907 and even more in 1908; the value of the exports arose from 1,430,750 francs in 1906 to 3,675,000 francs in 1908.

TOGOLAND. In this colony, where the interest of the natives in it continually increases, the cultivation of cacao has made great progress. The plantations are almost all found in the district of Misahöhe; trials made in the district of Atakpame have shown definitely that this region is not suitable for cacao-growing.

The Government of the colony has made great efforts to encourage this cultivation, in the interest of the natives, by distributing seeds and young plants. There only exists one European enterprise in cacao planting in Togoland—a plantation having an area of 90 hectares, which gave a crop of 884 kilos. (1 kilo = 2·2 lb.) in 1906, and 2,796 kilos. in 1907. The annual exports of cacao are increasing. They have been as follows: 1904, 10,617 kilos. worth 10,920 francs; 1905, 13,106 kilos. worth 11,897 francs; 1906, 28,651 kilos. worth 26,970 francs; 1907, 52,220 kilos. worth 62,410 francs.

SAMOA. The efforts which have been made already to develop the cultivation of cacao are beginning to have their results. The plantations extend in area from year to year; in 1907-8 they occupied 1,420 hectares, with 684,032 plants, of which 280,990 were giving a crop. In spite of unfavourable weather in the autumn of 1907, the exports arose from 90 to 117 tons; in 1908, the increase has been even more considerable. Up to the present, the cacao plants have not been attacked by any disease, and they are consequently strong and vigorous. The plantation companies estimate that the oldest cultivations can be made to give an average of 510 kilos. per hectare (= 449 lb. per acre). The natives of Samoa do not show much aptitude for agricultural work in connexion with which there is any difficulty, so that, in January 1908, 1,000 Chinese coolies were imported for employment on the plantations.

GERMAN NEW GUINEA. The cultivation of cacao in this colony is still in its infancy; the area under the plant in 1907-8 was 163 hectares. The number of trees on the plantations was 78,945, of which only 2,975 were yielding a crop. The exports in 1908 rose to 465 kilos. The chief enemies of cacao cultivation in New Guinea are weeds and insects.

DEPARTMENT NEWS.

Mr. H. A. Tempany, B.Sc., F.I.C., F.C.S., Government Chemist and Superintendent of Agriculture for the Leeward Islands, has been granted leave of absence from the 6th. instant, and left Antigua, for England, on or about that date. It is probable that Mr. Tempany will return to the Leeward Islands toward the end of December next.

Consequent on the above, Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, has been appointed, with effect from the 6th. instant, to act as Superintendent of Agriculture in Antigua, with permission to reside in St. Kitts, paying occasional visits to Antigua and the other Presidencies.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, left Barbados for New York, by the S.S. 'Cearense', on July 18, having been granted four months' leave of absence.

ST. VINCENT AGRICULTURAL SOCIETY.

A meeting of the Agricultural and Commercial Society of St. Vincent was held on June 17, at which the Imperial Commissioner of Agriculture was present. After his Honour the Administrator had introduced Dr. Watts to the meeting, a discussion took place which had for its subject the necessity of destroying old cotton plants, as soon after crop as possible, in order to prevent the spread of various pests, especially the leaf-blister mite. A thorough exposition of the different sides of the problem was given by various speakers, in order to assist as far as possible in arriving at a conclusion as to the best procedure to be taken.

After the discussion had taken place, the Commissioner gave an address on this and other subjects, in which he agreed with what seems to be the general opinion in St. Vincent, namely, the necessity that old cotton plants should be destroyed. Further, he stated that he thought the point had been reached at which the Government might be approached with the proposal to consider legislation for the destruction of old cotton plants, on or before a certain date after the close of each crop, as a means of coping with the leaf-blister mite. Dr. Watts also suggested remedies and preventive means in connexion with other pests that more particularly affect cotton. In relation to these, he suggested that meetings of the Agricultural and Commercial Society could be made especially useful by the discussion of subjects which interested planters most nearly, such as those relating to the cultivation of staple products, the methods adopted for the control and destruction of pests, and the means for obtaining improved yields. In regard to the arrowroot industry, he thought that consideration and experiments were required, especially in connexion with the utilization of waste products from the process of manufacture. He considered that it was possible to turn out three or four by-products from arrowroot waste, and it appeared likely that it could be employed in making cattle food, more especially by mixing certain of them with cotton seed meal.

In reference to implemental tillage, and its introduction into St. Vincent, Dr. Watts acknowledged the courtesy and actual assistance accorded to the planters of the island by those of Antigua, pointing out that, by the provision of such mutual help, the favourable industrial progress of these colonies would be ensured. He also expressed indebtedness to Mr. G. R. Corea for the ready and generous way in which the proposals of the Department had been met by him, and for the practical help given by him, with implemental tillage, in its experimental stage in St. Vincent. In conclusion, the Commissioner drew attention to the fact that the distinction which the products of the island had gained showed that planters were fully alive to the importance of modern and scientific methods in relation to practical agriculture.

Before the meeting adjourned, Mr. Conrad Simmons gave an account of his experience in relation to an experiment devised by him for the purpose of producing a strain of cotton possessing immunity from leaf-blister mite. The trials appeared to be of a successful nature, and Dr. Watts stated that if this proved finally to be the case, the financial value of the experiment would be very great.

The meeting terminated with a vote of thanks to the Commissioner, moved by his Honour the Administrator, and seconded by Mr. Simmons.

It should be stated that this information is abstracted from a report of the meeting which appeared in the St. Vincent *Sentry* of June 24, 1910.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 1, with reference to the sales of West Indian Sea Island cotton:—

About 200 bags of West Indian Sea Islands have been been sold since our last report, chiefly St. Vincent cotton, at 22*d*. to 26*d*.; the remainder being composed of Barbados and Antigua at 21*d*. to 21½*d*.

Owing to the fall in other growths of cotton, spinners of Sea Islands are rather inclined to hold off from the market, expecting lower prices. Stained West Indian is distinctly more unsaleable owing to the Egyptian decline, and considerably lower prices would have to be taken to effect sales, unless Egyptian cotton improves. Cotton which we were selling at 14¾*d*. to 15*d*., we are now only getting 10*d*. per lb. offered for.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 2, is as follows:—

Since our last report on June 11, the market has remained dull, with no demand. The stock in Factors' hands is now reduced to 53 bales, consisting principally of Planters' crop lots held at 50c. to 55c. There is also still left on plantation around Beaufort about 100 bales classing Fully Fine.

Although the season has practically closed, yet it is possible that some demand may spring up for the limited supply left unsold, which may be required by the trade before the next crop comes to market.

THE PROSPECTS OF EGYPTIAN COTTON-GROWING.

An abstract of a paper read at the Brussels International Cotton Congress, by Mr. A. H. Dixon, of Manchester, is given in the *Textile Mercury* for June 18, 1910. In this, it is stated that the tendency of the Lancashire cotton trade is always toward the consumption of finer grades of raw material; and that it is therefore important that every endeavour should be made to maintain an ample supply of cotton possessing high qualities. It is pointed out that there has been recently a comparatively large increase of mills dealing with Egyptian cotton, but that the cotton crop has not been increased proportionately.

The account goes on to show that the extension of the cotton-growing areas in Egypt has been from 977,735 feddans (feddan = 1·05 acre) in 1895-6 to 1,640,415 feddans in 1908-9, but that the yield is much less at the present time than it was from 1895 to 1898. In the last-mentioned years, the production was from 5·38 to 5·8 kantars (kantar = 101·31 lb.) per feddan, whereas that since 1902 has never been higher than 4·88, while in the years previous to 1909-10 it was as low as 3·80 kantars. The yield last year was even less, only about 3·3 kantars per feddan, so that the total crop reached less than 5,000,000 kantars, which, as is pointed out by Mr. Dixon, is a figure so startling that a retrospect of nearly twenty years must be taken in order to find such a small output.

The chief reasons adduced for this decreased yield were climatic conditions; deterioration of seed; water-logging of the soil; the over-supply of surface water; cotton worm; boll worm; deterioration of soil from over cropping; and the use of artificial manures. A serious accompaniment of the decreased output is the deterioration in quality that has taken place. Mr. Dixon adduces evidence to show that the true cause of this is deterioration in the quality of the seed, for the introduction of new seed has always given an increased production. From general considerations, it appears that the time during which a new kind of seed can be used is limited to twenty years.

One of the most important matters dealt with in the paper was the recommendation that steps should be taken to impress upon the Egyptian Government the necessity of the provision of a Government Department, whose efforts should be devoted entirely to the service of agriculture.

CROSSING SEA ISLAND AND NATIVE WEST INDIAN COTTON.

A communication has been received from Dr. C. E. Gooding, of Stirling, Barbados, describing experiments which have been undertaken by him in the direction of procuring hybrids between Sea Island cotton and the ordinary native cotton of the perennial type. In these, in July 1908, a seed from a large and hardy native cotton tree was planted, and the following January, when the plant was well grown, some of its flowers were pollinated with pollen from a good strain of Sea Island cotton, the procedure being to emasculate and bag the flowers of the native cotton on the evening preceding their opening; then to pollinate them from Sea Island flowers, and finally to bag them for twenty-four hours. All the flowers thus treated produced healthy bolls, which duly came to maturity.

When ripe, the seeds from these bolls were divided into two lots, one of which was planted by itself in April 1909, and the other, with other cotton seed, under ordinary field conditions, in the following July. The plants, especially those sown in April, attained a large size, but this extra growth had been anticipated, and allowed for, by setting them much farther apart than Sea Island cotton is usually planted.

The following table gives the particulars and results of the experiment:—

	Time of growth, months.	Number of trees.	Seed-cotton produced. ℔.	Seed-cotton ℔ tree. ℔.	Remarks.
Early planted hybrids	13	45	177	3·93	Exactly similar
Late planted hybrids	9½	25	35	1·40	field conditions
Sea Island	9½	—	—	0·22	

As is pointed out in the account of the experiment, the results show that, under exactly similar conditions, the yield of hybrid cotton was much higher than that from the ordinary Sea Island. In terms of weight per acre, it was more than twice as great, for, working out the results in this way, Dr. Gooding shows that the number of trees per acre and the yield of seed-cotton per acre were as follows: early planted hybrids, 648, and 2,549 ℔.; late planted hybrids, 1,210, and 1,694 ℔.; Sea Island, 3,630, and 795 ℔.

In order to gain information as to the quality of the lint, a special report was obtained on the cotton. This showed that those of the hybrid and Sea Island types were both practically the same, as the lint was of excellent length, strength and fineness, and the same price was obtained for both kinds.

Further experiments are required to show if heavy bearing is a definite property of the strain obtained, or whether it is due to the stimulus of crossing, and a greater immunity from disease, of the hybrids.

VARIETIES OF RUBBER.

CREPE, SHEET, AND BISCUIT RUBBER. Rubber reaches the home market in almost every possible shape and colour. In most cases, the queer names which one reads in the market reports are fairly descriptive. Thin pale crêpe, for instance, arrives in long strips, generally about 4 feet long and 8 inches to 12 inches broad. It varies in thickness from $\frac{1}{16}$ to $\frac{1}{8}$-inch, and has a roughish surface from which the name 'crêpe' is derived. This rubber is pale-yellow in colour, and when held up to the light it is quite transparent, which proves its purity, and accounts for the very high price obtainable for this grade—viz., at present about 10*s*. 3*d*. per ℔.

The so-called 'sheet' rubber is similar to crêpe, but slightly thicker, and not so transparent. It is prepared in a different manner and, unlike crêpe, must be put through the washing mills by the manufacturer before it can be used.

Hard cure, fine Para is prepared by the native labourers on the Amazon by dipping a so-called 'paddle' in the rubber, and then holding it in the smoke of a fire, which hardens the coating of milk on the paddle. The paddle is then dipped again for a second coating; and again smoked, and so on, until quite a large 'biscuit'—generally weighing about ½-cwt. —has been built up. The labourer then takes his knife and slits the biscuit down one side, in order to remove his paddle, when he proceeds to make his next biscuit. Rubber thus prepared is worth to-day about 10*s*. per ℔.

AFRICAN PRODUCTS. From the Congo we get large supplies of clean, solid, black rubber, coagulated originally in large blocks, and then cut up into small cubes, in order to allow it to dry and ripen. We also get from the Congo, rubber in reddish sausages, collected directly from the tree, the reddish appearance being caused by small portions of the bark adhering. The value of this Congo rubber varies to-day from 5*s*. 6*d*. to 6*s*. 9*d*. per ℔.

From the Gold Coast we get rubber prepared by the natives merely digging a trough in the earth and running in the latex, which in time coagulates from the outside and forms a hard skin, and finally a fairly hard lump throughout; but this grade holds all the moisture which was originally in the latex, and as a result, when cut across, such lumps are found to contain 50 per cent. of their own weight in water. Notwithstanding this, however, such rubber is to-day worth about 3*s*. 1*d*. per ℔. This is the so-called 'Gold Coast lump'.

On the Ivory Coast, the French Sudan, and in the Sierra Leone neighbourhood, the product is known as 'Sierra Leone Niggers', or 'Conakry'. This rubber is in large balls, consisting of strips carefully wound together, varying in size from that of a good-sized orange to that of a man's head. This rolling process is carried out when the strips of rubber are quite fresh, so that they become one compact, solid ball. Rubber treated in this way is of a reddish colour, for which reason these balls are often known as 'Red Niggers'; they are worth to-day approximately 6*s*. per ℔.

From the Niger District, we get rubber varying from small balls of fine, white rubber of excellent quality, known as 'White Niger Niggers', down to a soft, pasty substance which looks like bad honey and smells abominably. This is known as 'Niger Flake' and is worth about 1*s*. 2*d*. per ℔.

These descriptions might be multiplied indefinitely, but sufficient has been said to show in how many various shapes raw rubber arrives in the home market, and what a very wide experience is necessary to judge successfully the relative values of the different kinds.

One point in connexion with the values of the different varieties is, however, worth attention—namely, that values do not move together. For instance, the price of hard cure, fine Para may be going up when the price of Red Niggers is going down, and vice versa; each grade may be said to be a market to itself. There is, of course, some sort of relative proportion, but nevertheless each grade practically fluctuates by itself. The market reports of the auctions recently show that pale crêpe was fetching at the auction as much as 10*s*. 3½*d*., while hard cure, fine Para was selling at 9*s*. 9½*d*.; a fortnight before, the respective values were 9*s*. 7*d*. and 8*s*. 10*d*. per ℔. (From the *Agricultural Bulletin of the Straits and Federated Malay States*, May 1910.)

THE FEEDING HABITS OF BIRDS.

An account of a valuable enquiry into the feeding habits of the rook, which was undertaken in England and Wales is given in *The Journal of the Board of Agriculture* for May, 1910. In all, 631 birds from forty-one counties were examined, for the purpose of ascertaining the contents of the stomach.

The supposition that the food of this bird consists mainly of certain insects and earthworms was not borne out by the results of the investigation. As a matter of fact, there was surprisingly little animal food in the gizzard; in twelve months it only averaged 15 per cent. of the total amount.

In addition to that of the specimens during 1909, an investigation was made of 141 specimens collected in 1908, as well as of 58 which had been dissected previously. In the words of the article to which reference has been made, a summary of the results from these 830 birds showed that 67·5 per cent. of their food consisted of grain, 3·5 per cent. of seeds, fruit, roots and miscellaneous vegetable matter, 15·0 per cent. of wire worms and other insects, 10·5 per cent. of earthworms, and 3·5 per cent. of miscellaneous food (eggs, young game, field mice, etc.). Thus there is ample evidence to show that, with the present numbers of rooks in England and Wales there is a preference for a grain diet, and it seems that the usefulness of the bird might be increased by reducing this number.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with Some Considerations in the Treatment of Plant Diseases, with especial reference to the need of co-operation between those who desire advice and those whose part it is to give this.

An interesting and authoritative article on the manufacture of white sugar in Java is reproduced on page 227.

Information in regard to the packing and transportation of cacao pods is presented on page 228.

A description of several of the chief varieties of rubber, under the names by which they are known in the market, appears on page 231.

An account of an interesting experiment in crossing Sea Island and native West Indian cotton is given on page 230.

The Insect Notes, on page 234, contain Part III of the series of articles on the Acarina or Mites. Acknowledgement is made to the United States Department of Agriculture for permission to use the block for Fig. 34.

The Fungus Notes (page 238) give a review of cacao-spraying experiments that have been conducted recently in Trinidad.

Growing Cotton from Cuttings and by Budding.

In the *Annual Report of the Hawaii Agricultural Experimental Station* for 1909, a short account is given of experiments in growing cotton from cuttings, and by budding. The variety of cotton employed was Caravonica, and it was found that this could be successfully propagated by these vegetative methods.

As Sea Island cotton is only grown as an annual, these trials are not as important, in relation to it, as they are in connexion with the Caravonica variety. The feasibility, however, of raising the first-mentioned kind from cuttings may be worth trying, as it may form a means, under certain conditions, of conserving a given strain in a certain district when, for any reason, circumstances have interfered with the continuation of its propagation from seed.

Euphorbia Latex for Preventing Corrosion.

The *Agricultural News*, Vol. IX, p. 41, contained a note on this subject, and in reference to this, the following additional information has been kindly supplied by Mr. J. Burtt-Davy, F.L.S., Agrostologist and Botanist to the Transvaal Department of Agriculture. This shows that the common species of tree Euphorbia growing along the Natal coast is *E. grandidens; E. Reinhardtii* is also found in Natal and other parts of South Africa, and a species resembling *E. Tirucalli* of India and East Africa is also met with. It may be mentioned that the last species is grown in several of the Botanic Stations in the West Indies.

Mr. Burtt-Davy also states that the latex of *E. antiquorum*, and probably other species, is said to have been used in the East Indies and Morocco, some years ago, in the manufacture of a paint for iron, for preserving ships' bottoms.

The Action of Manganese Salts on Growing Plants.

In a note made on this subject, on page 159 of the current volume of the *Agricultural News*, attention was drawn to the statement, in the *Journal d'Agriculture Tropicale*, No. 105, 1910, that work had been done, in Hawaii, showing that the best soils for pine-apples are those which contain about 5·61 per cent. of manganese sesquioxide, while the least suitable contain only 0·37 per cent. of this substance.

Since this, through the courtesy of the Chief of Insular Stations, of the United States Department of Agriculture (Mr. Walter H. Evans), information has been received that the actual facts accord with the reverse of this statement, as the pine-apple plants were found to turn yellow and produce no fruit in soil containing a large amount of manganese.

This information was accompanied by a copy of Press Bulletin No. 23. of the Hawaii Agricultural Experiment Station, entitled *The Influence of Manganese on the Growth of Pine-apples,* in which the work to which reference has been made is described. This shows that, while manganese in small quantities may act as a stimulant to plant growth, in large amounts it is extremely injurious.

A Lime-Sulphur Wash for Use on Leaves.

An article appears in *The Journal of the Board of Agriculture* for June 1910, the object of which is to direct attention to the fact that a wash for use against certain fungus diseases of plants can be made by boiling lime and sulphur together, and that this wash differs from 'flowers of sulphur' and 'liver of sulphur', in that it is not easily washed off by rain. The special mixture that is dealt with was originally prepared and described at the Pennsylvania State College Agricultural Experiment Station, and an account of it is given in Bulletin No. 92 of that station. An extract of the chief contents of this bulletin, showing how the wash is made and stored, was reproduced in the *Agricultural News*, Vol. VIII, p. 311.

To return to the article first mentioned, which is written by the Mycologist to the South-Eastern Agricultural College, Wye, Kent, the chief conclusions reached are as follows: (1) a lime-sulphur wash made in the way described is effective against several serious fungus diseases of the apple in England; (2) it is cheap; (3) it does not readily wash off: (4) the quick deposition of sulphur which takes place after the wash has been applied makes it easy to see how thoroughly the spraying has been done. In conclusion, it is pointed out that Bordeaux mixture is still the best fungicide for general use against certain diseases of apples, and that the lime-sulphur wash must not be considered as a substitute for it, but only as a spray for varieties of apples which are injured by Bordeaux mixture.

The Yield of Camphor from Different Parts of the Plant.

In the *Agricultural News*, Vol. VIII, p.328, a note was given on experiments that have been conducted with camphor in Jamaica and Antigua, and it is pointed out there that, in both cases, the younger parts of the plant gave the largest yields. In connexion with this, attention may be drawn to experiments that have been carried out by the Agricultural Department of the Federated Malay States, an account of which is contained in the *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. VIII, p. 344.

In these trials, the same conclusion was reached, in connexion with the amount of camphor that can be obtained by distillation from different parts of the plant. In addition, the following interesting conclusions were obtained: (1) that air-drying, unless it is carried out in direct sunlight, does not reduce the yield; (2) that, under the conditions of the experiment, the principal products are camphor, with a small percentage of oil; (3) that in the Federated Malay States, a yield of at least 1 per cent. of camphor, with a small percentage of oil, may be expected from the prunings of trees five years old, and probably from trees younger than this.

Investigations have also been carried out by the same Department with the Borneo or Sumatra camphor tree (*Dryobalanops Camphora*), from which the valuable product known as Borneo camphor is obtained. This is not a true camphor, but a closely related compound called Borneol. It has not, so far, become an article of general commerce, but is chiefly used in various parts of the East for ritualistic purposes, and for embalming.

The Tobacco Industry in the United States.

The present status of the tobacco industry in the United States is defined in Circular No. 48 of the Bureau of Plant Industry, issued last February. According to this, there are produced in that country a number of distinct types of tobacco, each of which possesses definite characteristics which adapt it to certain particular trade requirements. It has thus been brought about that the types of leaf recognized by the trade are obtained from definite districts, so that the tobacco industry has become established most firmly in those districts where it has been carried on the longest. The important result of this condition is the circumstance that the merits of a product from a new growing area, or of a new variety, must be shown unmistakably, before it is accepted, and even then, it must be identifiable with an already established type.

The Trade and Commerce of Sicily, 1909.

No. 4,441 Annual Series, of the *Diplomatic and Consular Reports* deals with the trade and commerce of Sicily for the year 1909. This shows that the quantity of citrate of lime deposited with the Green Fruit Chamber (see *Agricultural News*, Vol. VIII, p. 377) was 7,500 metric tons (of 2,200 lb.), of which 500 tons was carried over from the previous season. The amount of concentrated lemon juice deposited during the same period was 4,039 pipes. During the time under review, 1,594½ tons of citrate of lime were sold for about £104,046, while the amount of lemon juice disposed of was only 32 pipes, of a value of about £586. Since this time, financial difficulties have caused the Government to delegate a committee to enquire into the condition of the chamber and to propose measures for its reorganization. This action was followed by the resignation of the Council of the Chamber, and a Royal Commissioner has been appointed to take over the administration.

It is estimated that the October to December crop of citrus fruit, 1909, on which the whole season's calculations are based, was about one-quarter less than that of a normal year and one-third below that of the preceding similar season. As the new crop of lemons is below the average, it is predicted that the citrate produced during the current season will not be more than about 4,500 tons.

The increase, last year, in the United States tariffs caused considerable anxiety to producers. It is not anticipated now, however, that the increased duty will have any injurious effect on Italy's trade with the Eastern States, on account of the fact that the United States railways have raised their freight rates for Californian fruit to an extent which compensates for the effect of the increased tariff.

INSECT NOTES.

THE ACARINA OR MITES.

PART III.

GAMASIDAE. This family includes, among many other forms, the poultry mites, which in Barbados at least, are commonly known as nimbles. This group of mites is characterized by the small pincer-like arrangement of the mandibles. The individuals are very minute in size, and inconspicuous in colour. The poultry mite, which may be taken as an example of the family, is *Dermanyssus gallinae*, a species of world-wide distribution as a pest of domestic fowls. The normal colour is light-brown or whitish, but full-fed individuals are reddish, from the blood with which they are engorged. These mites hide in the vicinity of fowl roosts during the day, and come out at night and attack the fowls. When they occur in enormous numbers, as sometimes happens, the effect on the poultry is so severe as to justify including this among the most serious pests of the poultry yard. They very seriously affect the condition of fully grown fowls, and have been known even to kill out an entire brood of newly hatched chicks. Cleanliness is one of the precautions to be taken against nimbles. The perches should be made detachable so that they may be taken out and carefully washed, and the house or pen should be cleaned by spraying with kerosene emulsion, or by the use of lime-wash, kerosene emulsion probably being the more effective on account of its greater penetrating power, which enables it to get into the very small crevices where the mites are in hiding.

The houses and perches may also be kept clean by the use of boiling water, kerosene, benzene, or gasolene The free use of lime is also beneficial, and a good dust bath for the fowls helps greatly in repelling the attacks of their nightly visitors. It is of advantage also, where the construction of the house will permit, to apply coal tar to the ends of the perches, after these have been cleansed, in such a way that the mites will have to cross it in order to reach the fowls. As long as the tar remains soft on the surface, the mites will be unable to get across. The use of sulphur or tobacco stems in the nests of sitting hens will also be found valuable, and in each island of the West Indies certain plants are commonly credited as having repellant properties toward mites and other pests Among these may be mentioned the leaves and twigs of the wild olive (*Bontia daphnoides*) and of a species of Jatropha.

IXODIDAE. This family includes the ticks, the largest of all the mites. They are of very great importance because of their parasitic habits and because, in the case of many of them at least, they are intermediate hosts in the life-history of parasitic diseases, some of which are very serious in the case of domestic animals.

The ticks are provided with a very formidable mouth, well adapted to their piercing and sucking habits. They are covered with a tough, leathery skin, which in the front part of the body forms a hard protecting shield; the hinder part of the body is capable of considerable distention, and fully fed individuals are much larger on this account than unfed ones, in the same stage of development.

The cattle tick, or Texas fever tick, is perhaps, in point of amount of damage done, the most important of all the ticks. In the Southern States of America, this has caused losses in the cattle industry estimated at as much as \$40,000,000 per annum. The injury to cattle arising from this pest is estimated to be of three distinct kinds; firstly, the tick is a direct parasite, weakening the animal by loss of blood; secondly, the inflamed areas resulting from tick attacks often attract the screw worm fly, *Chrysomyia macellaria*; and thirdly, it is a carrier of the disease mentioned. In cases of gross infestation, it has been estimated that as much as 200 ℔. of blood may be drawn from an animal in the course of a season, but the greatest loss sustained by the cattle industry is that due to the ravages of the disease, which results from the presence in the blood of a protozoan parasite, *Piroplasma bigeminum*, which under natural conditions, can only be transmitted by the bite of an infected tick, as far as is known.

Although several species of ticks are liable to be found feeding on cattle, only one species in each district is known as the carrier of the parasite causing Texas fever. In the United States this is *Boophilus annulatus*, or *Margaropus annulatus* (Fig. 34), as it has been called recently. As the life-history and habits of this tick have been carefully studied, it may be taken as an example of the family.

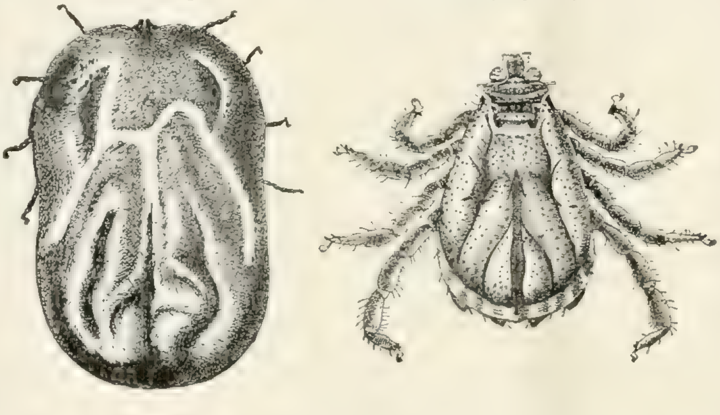

Fig. 34. Cattle Tick. (Female on left; male on right.)

The cattle tick is reddish in colour, somewhat flattened, becoming greatly distended when fully fed. The life-history includes four distinct stages: the egg, the larva, the nymph and the adult. The eggs are laid on the ground, where they hatch after a varying period of time, according to temperature, or the extent to which moisture is present. The larvae are very small, active creatures, capable of existing for many days, or even weeks, without taking food. Immediately on hatching, these larvae, which in some places are called seed ticks, and in others grass lice, climb up on grass or weeds, where they await some passing animal, which would serve as host. When a suitable animal comes along, they attach themselves, and almost immediately begin feeding. After a short time, the larval skin is cast, and the six-legged larva transforms to the eight-legged nymph, which in its turn becomes fully fed, and changes into the adult condition.

At this time, the sexes are developed, the males being somewhat smaller than the females. After mating, the males soon die, and the females continue feeding until they are fully fed, in which condition they are many times the original size. As soon as the female has become fully fed, she releases her hold and drops to the ground, for the purpose of depositing eggs, which often number several thousands. The period of egg-laying marks the end and beginning of one life-cycle. The length of time occupied by this varies greatly, according to climatic conditions, a period of from six to ten months being required in warm weather, and a much longer one in the cold season. In certain of the West Indian islands, it is likely that the dry season has the effect of retarding the development of ticks in a manner

similar to the cold weather of temperate regions. Under normal conditions, the female tick undergoes all its development, from the attachment of the seed tick to the dropping off of the fully fed adult, without leaving the host animal. That is to say, any given tick only feeds on one host animal. From this it will be seen that the fever is not transmitted by the tick which was fed on an infected animal, but by the seed ticks which hatched from the eggs laid by an infected adult.

THE UTILIZATION OF THE PRICKLY PEAR.

The following discussion as to the feasibility of using the prickly pear in various ways is taken from an article in the *Bulletin of the Imperial Institute*, Vol. VIII (1910), p. 43. It will be seen to contain much information that is of a useful nature:—

In 1908, the remarkable announcement was widely published that a chemist in Brisbane had discovered valuable commercial possibilities for the prickly pear, which led him to conclude that, instead of the plant being ruthlessly destroyed, its cultivation ought to be encouraged. The principal claims put forward were (1) that from 1 ton of prickly pear 7 gallons of alcohol could be prepared at a cost not exceeding 3*s.* 6*d.* per gallon, whilst the refuse could be made into a nutritious cattle-food; (2) that the plant yields an excellent sugar, 2 tons of prickly pear yielding as much sugar as 3 tons of sugar-cane, and of equal quality; and (3) that the fibrous nature of the material renders it suitable for the manufacture of paper, straw-board and other articles, and that these could be more cheaply produced from prickly pear than from any product now used for the purpose.

The suggestion with regard to utilizing the plant for the manufacture of alcohol is not new. Proposals of this kind have been made previously in New South Wales, Mexico, Spain, India, and other countries, but it does not appear that alcohol has ever been obtained from this source on a commercial scale. The juice of the fruit contains saccharine matter, and undergoes spontaneous fermentation; the alcoholic liquid thus obtained is used by the natives of Mexico and other countries as a beverage. It seems improbable, however, that this liquid could be profitably employed as a source of alcohol, for the following reasons.

Alcohol of 90 per cent. strength can be manufactured from cheap materials, such as maize and potatos, at a cost of from 6*d.* to 1*s.* per gallon, depending on the market price of the raw materials, and other local factors. It is evident, therefore, that the production of spirit from prickly pear juice could only be remunerative in a country which had no other crops available for the purpose, and which had a heavy duty on imported alcohol. Moreover, the researches of Ulpiani and Sarcoli, in 1902, have shown that not only would the manufacture of alcohol from prickly pear juice be unprofitable, but also that it is scarcely practicable. These chemists found that the juice of the fruit of the prickly pear contains 12·8 per cent. of sugar, which consists not of sucrose (or cane-sugar) but of a mixture of glucose and fructose. The spontaneous fermentation of the juice is due to the action of a natural yeast which occurs on the fruit, and has been termed *Saccharomyces opuntiae.* This yeast does not ferment cane-sugar, but only glucose and fructose. The fermentation takes place very slowly, and even after a long time the proportion of alcohol is not equivalent to the amount of sugars originally present. Added yeast, however, is rapidly suppressed by *S. opuntiae*, and it would therefore be necessary to kill the latter by sterilizing the juice before introducing the ordinary yeast. On account of the expense of sterilization, it is regarded as desirable to find a yeast capable of producing alcohol rapidly in the presence of the neutral yeast (*S. opuntiae*), as only in this way could the manufacture of alcohol from the juice become practicable.

With regard to the manufacture of sugar from the prickly pear, it is obvious that if the contention of Ulpiani and Sarcoli, that the juice contains only glucose and fructose is correct, no cane-sugar could possibly be obtainable.

With reference to the utilization of the prickly pear for paper-making, experiments at the Imperial Institute have shown that a pulp can be prepared by the process of heating the fibre of the plant with caustic alkali under pressure, but that the product so obtained consists of very short fibres (about ·125-·33 inch long), and would therefore be of comparatively low value. Samples of the fibre of a South American species (*Opuntia Dillenii*), which occurs in India, were shown at the Colonial and Indian Exhibition which was held in London in 1886. Paper makers who examined these samples, however, regarded them as worthless in comparison with other cheap and plentiful materials. It is probable that the collection of the raw material would be a costly operation. Moreover, a little consideration will show that an immense quantity of the plant would have to be dealt with in order to produce a comparatively small amount of paper pulp. Analyses of various parts of the prickly pear at different ages in the United States of America (*Bureau of Plant Industry, Bulletin No. 102, Part 1, United States Department of Agriculture*, 1907) have shown that, on the average, the fresh plant contains 84·3 per cent. of water and 2·4 per cent. of 'crude fibre'. Experiments at the Imperial Institute have proved that 100 parts of dry prickly pear fibre yield about 42 parts of dry paperpulp. Hence from 2·4 parts of the crude fibre about 1 part of the pulp could be obtained. It is true that the 'crude fibre' of the analysis was extracted by a different process from that used in the preparation of the fibre employed in the Imperial Institute experiments, but this would not greatly affect the results arrived at. It is evident, therefore, that for the manufacture of 1 ton of paper pulp it would be necessary to cut about 100 tons of the fresh plant. When to the cost of collecting and handling this mass of material is added that of the chemicals and labour required for the extraction of the fibre and its conversion into paper pulp, it seems evident that the project could not possibly be remunerative, especially as the product is of low quality, and would not in any case be worth more than a few pounds per ton.

In conclusion, it appears that the only purpose for which the prickly pear could be used successfully is as a cattle food. Opinions with regard to the value of the material for this purpose are, however, very conflicting, and, at best, it would constitute a product of somewhat low nutritive value, and could only be used in conjunction with richer feeding stuffs, such as wheat bran or cotton seed meal. In the previous article on this subject (*Bulletin*, 1908, 6, 314) allusion was made to the production of a spineless variety of prickly pear in California. It does not appear safe, however, to encourage the cultivation of such forms until they have been subjected to prolonged trials, especially as there is always a danger that they may revert to the spiny condition. Trials have been made recently in South Africa with so-called spineless varieties, which have proved to be not altogether spineless, but are, nevertheless, regarded as much superior to the ordinary spiny forms as a feeding-stuff for cattle.

GLEANINGS.

A leaflet issued by the Department of Agriculture of Eastern Bengal and Assam, dated May 12, 1910, shows that the average wholesale price of rice in that part of India has fallen by about 19 and 29 per cent., as compared with the prices prevailing at the end of April, in 1909 and 1908, respectively.

Ordinance No. 4 of 1910, Dominica, has been published recently. This is known as the Dominica Forests Limited Acquisition of Lands Ordinance, 1910, and its object is to empower the Limited Liability Company called 'Dominica Forests Limited' to acquire land for the purposes of its undertaking.

A report by the Acting Registrar of Imports and Exports at Singapore shows that the exports of Para rubber from the Straits Settlements in 1909, amounted to 4,504,433 ℔. as against 3,659,906 ℔., in 1908. By far the greatest proportion of this rubber went to the United Kingdom, the amounts being 3,860,459 ℔. and 3,004,883 ℔.

The quantity of linters produced in the United States from re-ginning cotton seed of the crop of 1909 amounted to 313,478 bales, as compared with 114,544 bales from that of 1899. Much of this fibre was disposed of at less than 1c. per ℔. during 1907-8, but it has been in greater demand this season, the average price returned for it being 3·2c. per ℔. (*Sugar Planters' Journal*, June 18, 1910.)

In the Botanical Magazine for June, one of the plants, *Agave Franzosini*, which has been introduced into some of the West Indian Botanic Stations during recent years, is described. From the information given, it appears that this plant, which is a native of Mexico or Central America, when it reaches the flowering stage, produces an inflorescence which grows to nearly 40 feet, and is in the form of a panicle, having a diameter of about 10 feet.

According to the *Diplomatic and Consular Reports*, No. 4,450, Annual Series, the quantity of vanilla produced in Réunion for the four years 1906-7 to 1909-10 was 35,588, 48,865, 70,000, and 39,500 kilos. The recent over-production of vanilla has reduced the amount growing in that island by about one-half. The prices of vanilla rose very considerably, the best quality being sold at an average rate of £1 9*s*. 6*d*., during last year, as against an average of 18*s*., the year before. The price of the inferior qualities also increased in proportion, so that it would seem that, not only in Réunion, but in other vanilla-growing countries, the production has been limited purposely during 1909.

An Ordinance to provide against the spreading of ankylostomiasis has been passed recently in Grenada (No. 5, of 1910). By this, provision is made for the compulsory treatment and detention of persons infected with the disease; for the giving of the accommodation necessary in connexion with preventing its spread; and for the framing, altering and revoking of regulations against the disease, by the General Board of Health.

A Committee has been appointed by the President of the Board of Agriculture and Fisheries for the purpose of advising it on all scientific questions which bear directly on the improvement of agriculture, and especially as to the methods to be adopted (a) for promoting agricultural research in Universities and other scientific schools; (b) for aiding scientific workers engaged in the study of agricultural problems; and (c) for ensuring that new scientific discoveries are utilized for the benefit of agriculturists.

A new process for the purpose of coagulating rubber latex has been devised by the Elias Pure Rubber Process, Ltd., of 7 to 10, St. Mary-at-Hill, London, E.C. In this, a preservative paste is dissolved in warm water, and added to the latex as it collects in the cups. The effect is to keep the latex in a liquid and unchanged condition, until the successive collections can be bulked and coagulated all together. The coagulation is brought about by means of another reagent, which, being in a solid form, can be easily sent out to rubber-growing districts.

The *Monthly Consular and Trade Reports*, for April 1910, gives a statistical review of the world's sugar crop which shows, in the result, that the production of beet sugar has steadily grown less during recent years, while that of cane sugar has increased to such an extent as not only to cover the shortage in beet sugar, but also to add to the market a sufficient quantity to supply the world's demand for sugar, with a limited surplus, at the end of the season, which is scarcely sufficient to keep the world supplied for six weeks.

The *Quinzaine Coloniale* (Paris) for May 25, 1910, states that there is likely to be considerable development in the rubber industry in Cochin-China. Attempts were made to cultivate rubber there as far back as 1897 and 1898, but the matter has only been taken up in real earnest in recent years. At present, there are about fifteen plantations, containing 650,000 Hevea plants, and though the industry is in its infancy, it is estimated that, by the end of this year, this number of plants will be extended to about 1,000,000. (The *Board of Trade Journal*, June 9, 1910.)

A report by H. M. Acting Consul-General at Rio de Janeiro states that the Government of the State of Para is endeavouring to cause means to be taken in order that rubber planters should start cultivation in regions that are more easily reached from the coast. This Government also desires to bring about the existence of regulations which shall fix the age at which the first tapping shall take place, and the height that the trees must have reached before they are made to yield latex. Proposals are also being made for the exploitation of rubber with Government aid.

STUDENTS' CORNER.

AUGUST.

First Period.

Seasonal Notes.

Among the different varieties of cane, some are difficult to establish; that is to say, they do not grow readily after they have been planted, and there is a necessity to supply many of the holes. In what way is this important, in relation to the working of an estate? Again, the rate of growth, among different varieties of cane, varies to a considerable extent. How may use be made of this fact in attempting to obtain a good stand of cane? Discuss the characters of different varieties of cane, in this relation, with especial reference to B.147, B.208 and Red Ribbon. Discuss carefully the essential differences between raising a plant from a sugar-cane cutting and from a cutting of a dicotyledon, such as the hibiscus.

Observations on cotton stainers should be made (see, especially, *Agricultural News*, Vol. VIII, p. 330). At this time, they will most generally be found in such places as cotton stores and ginneries, and on other host plants, besides cotton, such as the silk cotton tree. What kinds of damage are done by these insects? Describe the best measures that can be taken against them. A useful experiment in connexion with these insects may be conducted as follows: Six dry plates are taken and are placed, over water, on some suitable form of support, each plate having its own stand. On each plate, one hundred cotton seeds, taken at random from a supply of good, undisinfected seed, are placed. Three of the plates are selected and about twenty cotton stainers are put on each of them. On the next day but one, these are removed, and a fresh supply put in their place. The experiment is continued in this way for eleven days, care being taken that no cotton stainers are able to reach the three plates on which they were not placed at first, as these are intended to act as controls. At the end of eleven days, the seeds in all the plates are washed quickly in water that has just been boiled and allowed to cool, and are placed in six different germinators, care being taken that the seeds in the different lots are kept separate from one another. The differences in the percentages of germination will indicate whether or not the insects are in the habit of attacking and damaging cotton seed, and the results obtained in this way will be supplemented by careful observations that were made on the behaviour of the insects, during the course of the experiment. In addition, on the larger scale, other observations will show if these insects spread from cotton stores and ginneries, and (in some cases) if old cotton plants that have been left in the field, instead of being destroyed, give them favourable conditions for existence, until the new cotton has reached a stage at which it is likely to be attacked by them.

When cotton seed is being sown, dig up some of the soil, from place to place, in the field, in order to ascertain if it contains the large, fat grubs that are most commonly found in rotted stable manure and in gardens. Note, as far as you can, whether these grubs do any damage to the young plants. To what insect, or insects, do these grubs belong? Are there any other animal pests in your district that are likely to attack the part of the cotton plant that is below the surface of the soil?

Among the observations that may well be made on cotton seedlings at the present time is that of taking notice as to whether any of them are rotting at the collar; this is especially to be looked for if the seedlings appear to be wilting and dying. To what is this rot most likely to be due, and what conditions are most liable to lead it to attack young plants?

The end of the cacao crop has been reached, and at this time, the trees are losing their leaves. What are the chief reasons why trees shed their leaves. In what way is the loss of the leaves from a plant brought about? The dead leaves will be collected and, together with other waste vegetable matter (but not the remains of diseased pods), will be applied as a mulch to the soil around the trees. What is the primary use of a mulch? State what a mulch of leaves adds to the soil which grew the plants on which they were borne. What improvement is effected by adding leaves to a soil?

A careful, practical study should be made of the methods of budding and grafting cacao; for an account of the latter, consult Pamphlet 61 of the Department series, entitled *The Grafting of Cacao*. Remember that a proper knowledge of these subjects cannot possibly be obtained by merely reading books; actual practical work is necessary before useful acquaintance with the methods can be obtained.

Note the usefulness of bedding the soil under nutmeg trees with dead leaves and other waste vegetable matter, in order to prevent the loss of nuts when they are dropping. What part of the fruit body is (a) the nutmeg, (b) the mace?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by the texture of the soil? Give methods by which this may be maintained in good condition.

(2) Draw up a scheme showing how the quality of a piece of land may be judged by the kinds of wild plants growing on it.

(3) Describe the root hairs and root cap of any plant that you have examined. What are the uses of these structures?

INTERMEDIATE QUESTIONS.

(1) Discuss the advantages of possessing an analysis of the artificial manures that are to be used on an estate.

(2) Give a general account of the structure of an ovule.

(3) In what ways will the soil and trees benefit, in an insufficiently drained cacao orchard, by the deepening of the drains?

Tuberculosis in Fowls.—According to Bulletin No. 161 of the California University Experiment Station, tuberculosis in fowls, a serious pest in Europe, seems to be rare in America, or at any rate, has not been reported frequently. The bulletin goes on to show that the disease is distributed, in California, to a sufficient extent to demand the serious attention of poultry raisers. It is of an insidious nature, for it fails to attract much attention at any given time, but takes a steady toll of the flocks, which causes a fair degree of financial loss in the long run. The disease does not seem to occur in young chickens, but as far as has been observed, attacks grown fowls, only.

The remedies suggested are: (1) the destruction of fowls showing symptoms of the disease; (2) isolation of affected flocks; (3) disinfection of fowl houses; and (4) the keeping of pullets away from diseased stock or infected land.

FUNGUS NOTES.

CACAO SPRAYING IN TRINIDAD.

In the article on Cacao Canker which appeared in the last number of the *Agricultural News*, reference was made to the results of experiments on cacao spraying, obtained by J. B. Rorer, M.A., Mycologist to the Board of Agriculture in Trinidad. As these results may be of some interest to readers, it is proposed to give a more detailed account of them in this article, and to mention, in addition, a few other considerations which have to be taken into account when proposing to extend the treatment to some of the other islands of the West Indies. A full account of these experiments, written by Rorer, will be found in *The Bulletin of the Department of Agriculture*, Trinidad, Vol. IX, p. 10, and the Annual Report of the Mycologist to the Board of Agriculture, Trinidad, 1910.

Preliminary experiments were conducted in July, 1909, at Santa Cruz and Tumpuna to determine the effect of various strengths of different spraying mixtures on flower buds, flowers, young fruits and leaves. The sprays used were Bordeaux mixture of two strengths, the first containing 5 lb. of copper sulphate and 5 lb. of lime to 50 gallons of water, and the second containing 4 lb. of copper sulphate, and 4 lb. of lime to the same volume of water; in addition, various strengths of a proprietary lime-sulphur solution were also experimented with. Both strengths of Bordeaux mixture were found to injure the flower buds, flowers and tender leaves, but were harmless in the case of small fruits and older leaves. The same was true of the lime-sulphur wash when diluted down to 1 part in 25 of water; but when diluted to 1 in 30, it was harmless to the flower buds and the few flowers that were open at the time. The injurious effect of the Bordeaux mixture was probably due, to some extent, to the wet weather.

Following on these preliminary experiments, work on a somewhat larger scale was undertaken, for which a block of 1,000 trees was selected, and divided into two equal parts. All the trees were of the same age, and the general conditions of soil, drainage and shade were identical, and, moreover, the results of a picking made before the spraying was commenced indicated that the yield of cacao from each plot was practically the same, and that the relative proportion of black cacao was identical for each plot. The term 'black cacao', used throughout the experiments, is intended to indicate pods which have been so attacked that the beans have been infected. No attempt was made to differentiate between the various diseases which were responsible for the black cacao.

Plot 1 was sprayed on September 6 and 21 with Bordeaux mixture 5-5-50 (as indicated above), while plot 2 was left unsprayed, as a control. The spraying was done with a barrel pump, fitted with two 75-foot leads of hose, and bamboo extension rods 8 feet in length, with double Vermorel nozzles. The object was to spray each tree thoroughly, including the leaves, pods, trunk and branches. At the time of spraying, the trees were covered with young fruits from ½-inch to 3 inches in length, and bore a few older pods. A small picking was made in September, when the yield from each plot was found to be the same, as the effect of the spraying had not yet shown itself. Two main pickings were made, on November 12 and December 11, when the following results were obtained: Plot 1 gave a total of 3,219 pods, of which 2,930 were sound and 289 were black, so that the percentage of black pods was 8·9. The control plot No. 2 gave a total of 3,104 pods, of which 2,182 were sound and 922 were black, i.e., 29·7 per cent. of the pods were diseased. An examination of these figures shows that not only was the percentage of black pods greatly reduced, but at the same time there was an increase in the total number of pods obtained from plot 1, as compared with those obtained from plot 2. As a result of these two factors, the sprayed trees from plot 1 yielded 189 lb. more good cacao than the unsprayed trees on the control plot. Two other pickings were subsequently made on January 14 and February 15. On this occasion, plot 1 gave 2,829 pods of which 2,677 were sound and 152 or 5·4 per cent. were black. Plot 2 yielded 1,629 pods of which 1,308 were sound and 321 or 19·7 per cent. were black. The sprayed trees yielded 1,200 more pods than the control plot, probably because several pods were saved from fungus attack, when quite small, by the spraying which had been carried out when they were very young. As a result of the four pickings, 1,315 more pods were obtained from plot 1 than from plot 2; 7·3 per cent. of the total number from the sprayed trees, and 26·3 per cent. from the control plot, were black. Owing to these two factors, 2,117 more sound pods were picked from plot 1 than from plot 2.

In addition to giving the great increase in yield indicated by these figures, spraying is beneficial to the trees in other ways. As was indicated in the article in the last number of the *Agricultural News*, Rorer has found that canker in Trinidad is due to the fungus, *Phytophthora omnivora*, which causes black rot of the pods, and the reduction of the number of diseased pods due to the spraying, together with the direct effect of the spraying on the trunks of the trees, would probably tend to greatly reduce the amount of canker on any given plantation. This is a factor of considerable importance. In addition to this, the spraying reduces several minor diseases, such as thread blights, anthracnose of the pods, etc, and keeps the tree free from moss. It would probably also have a considerable effect on the presence of brown rot, die back and stem disease, due to *Lasiodiplodia theobromae*. Another factor that must be taken into consideration is the cumulative effect of the spraying, as a result of which the increase in yield would be progressively greater for several years until a point was reached at which the trees were giving their maximum yield under the general conditions which obtained on the plantation.

While calling attention to the interesting results gained by Rorer, it is not the purpose of this article to unduly emphasize the importance of spraying in connexion with cacao cultivation. In the case of many of the islands of the Lesser Antilles the general conditions of cultivation, the lie of the land, and the difficulty of obtaining water, often render the adoption of this practice almost an impossibility. It should be remembered also that to obtain the best results, spraying should not be employed alone, but in conjunction with general sanitation of cacao plantations; such measures are the careful burial with lime of the pods, and of all diseased material, whether pods or twigs, removed when pruning, together with careful tarring of the wounds thus made. Under the conditions in which all these methods can be reasonably employed, it would probably be found that a very large increase in yield would be obtained which would not only cover the expense involved in carrying out the remedial measures, but also ensure a very considerable increase in profit.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of June :—

On the general condition of the drug and spice markets during the month of June, the only remark to be made is that they have been purely normal, which is the usual state of things at the close of the half-year, with the accompaniment of stock-taking, followed by the beginning of the summer holiday season, until the close of which, little or no change may be expected. Buchu leaves and rubber still attract much attention, and demand high prices, but no special interest has been shown in any West Indian product.

GINGER.

Somewhat lower prices have prevailed, and a declining demand. At the first spice auction on the 8th of the month, the offerings were as follows: 363 packages of Jamaica, 300 of Cochin and 384 of limed Japan. The whole of the Jamaica consignment was bought in at from 54*s.* to 63*s.* for good ordinary and middling. Washed rough Cochin was bought in at from 48*s.* to 52*s.* 6*d.*, while 300 bags of the limed Japan were sold without reserve at from 37*s.* 6*d.* to 38*s.* per cwt. On the 22nd, some 700 barrels and bags of ginger were brought forward, very few of which sold, and those at lower rates, varying from 50*s.* to 51*s.* for common dark, and 54*s.* to 56*s.* for good common; 45*s.* was the reserve price for fair limed Calicut, and 52*s.* for small and medium bright washed Cochin.

NUTMEGS AND MACE.

Steady rates have been maintained throughout the month in the case of nutmegs. At the spice auction on the 15th, 309 packages of West Indian were sold, out of a total of 329 offered. At the same auction, 58 packages of West Indian mace found buyers at the following rates: 1*s.* 8*d.* to 1*s.* 10*d.* for palish and pale, 1*s.* 7*d.* to 1*s.* 8*d.* for pale and reddish, and 1*s.* 6*d.* to 1*s.* 8*d.* for pale broken. Ordinary broken realized 1*s.* 4*d.* per lb. On the 29th of the month, 27 packages of West Indian were sold, fair palish fetching 1*s.* 9*d.*, and good pale 1*s.* 11*d.* per lb.

ARROWROOT.

At the auction on June 1, 42 barrels of St. Vincent arrowroot, ordinary manufacturing, sold at $1\frac{7}{8}$*d.* per lb. A week later, as many as 718 packages St. Vincent were offered, and all bought in at from 2*d.* to $2\frac{1}{4}$*d.* per lb. for fair to good manufacturing.

SARSAPARILLA.

At the drug auction on the 2nd, Grey Jamaica was represented by 33 bales, all of which were sold at the following rates : for fair, slightly roughish, 1*s.* 2*d.* to 1*s.* 3*d.* per lb., and damaged 1*s.* 1*d.* Twenty-six bales of native Jamaica were also disposed of, fair red fetching 11*d.* to $11\frac{1}{2}$*d.*, dull red 10*d.*, and $8\frac{1}{2}$*d.* to 9*d.* for mixed common dull and yellow; 33 bales of Lima-Jamaica, were offered, most of which were disposed of at from 10*d.* to 11*d.* per lb. At the auction on the 16th, 7 bales only, of Grey Jamaica were offered, all of which met with a ready sale, fair sound fetching 1*s.* 3*d.* and sea-damaged 1*s.* 1*d.* per lb. Out of 30 bales of Lima-Jamaica offered, 3 only were disposed of, at 10*d.* per lb. Of Mexican, 4 bales were offered and disposed of without reserve at 4*d* per lb. On the 30th of the month, 4 bales of Grey Jamaica were brought forward and sold at 1*s.* 2*d.* per lb. Native Jamaica was represented by 37 bales, only 10 of which met with purchasers, fair to good red fetching $10\frac{1}{2}$*d.* to 1*s.*, and tawny $10\frac{1}{4}$*d.* per lb.; 30 bales of Lima-Jamaica were offered and bought in at from 10*d.* to 11*d.* per lb.

CASSIA FISTULA, KOLA, TAMARINDS, LIME JUICE.

At the first drug sale, 6 bags of good West Indian Cassia Fistula pods were sold at 17*s.* per cwt. One bag of bold bright West Indian kola nuts, in halves, realized $2\frac{3}{4}$*d.* per lb. Again, in the middle of the month, 5 bags were sold out of 23 offered, of fair West Indian halves, at 3*d.* per lb.; 13 bags of fair Ceylon were also offered and sold at 3*d.* per lb. At the beginning of the month, fair pale Barbados tamarinds were sold, in bond, at 14*s.* per cwt., and a fortnight later 34 packages of dry palish St. Kitts were offered, 9 of which sold at 10*s.* per cwt., in bond, the remainder being bought in at 12*s.* 6*d.* At the last sale in the month, tamarinds were represented by a large quantity of dark West Indian from Nevis, a small portion of which sold at 10*s.* 6*d.* in bond. In the beginning of the month, ordinary to good raw West Indian lime juice realized from 11*d.* to 1*s.* 2*d.* per gallon, at which price there was a quiet demand.

TRADE AND COMMERCE OF JAVA, 1909.

The trade and commerce of Java for 1909 is dealt with in No. 434, Annual Series, of the *Diplomatic and Consular Reports*, issued in May 1910. This shows that the sugar crop of 1909 in Java has been a good one, on the whole, and high prices have been obtained. Although the area under cultivation was larger than that in 1908, the yield of sugar per acre was less in 1909 than in that year, on account of the deterioration in the quality of the juice and a short crop in Mid Java, caused by continual heavy rains during the early months of they ear. The most recent returns show that the area planted in cane for 1910 is about 2·7 per cent. more than in the year before. It was considered that if favourable weather was experienced early in 1910, the prospects for the crop of that year are good.

Statistics for 1909, subject to modification, showed that the total production of sugar was 1,248,094 tons from 302,065 acres; so that the yield per acre was 4·13 tons. The number of mills working was 181.

The production of coffee in 1909, was 13,256 tons; for 1910 it was estimated to be 13,421 tons. The exports of tobacco were fully 200,000 packages less than in 1908, because of the unfavourable weather. The output of rice during 1909 was 53,100 tons, as against 21,800 in the previous year. There was a lessening in the exports of copra, which were 72,000 tons, compared with 94,976 tons in the previous year. Of oil seeds, the shipments were roughly as follows: ground nuts 16,000; castor seeds 3,000; kapok (silk cotton) seeds 12,000 tons.

The report states that the rubber production of Java is still inconsiderable, and will remain so for some years to come. Clearing and planting of new ground have been accomplished to a large extent during 1909, and the demand for land for rubber cultivation has been strong. An attempt to ascertain the amount of capital sunk in rubber estates in Java, Sumatra and Dutch Borneo at the end of 1909 has shown that this is £5,640,000, made up as follows : British £2,500,000; Dutch £1,500,000; Franco-Belgian £1,455,000; German £185,000. These figures are, however, approximate.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 5, 1910; Messrs. E. A. DE PASS & Co., June 24, 1910.

ARROWROOT—St. Vincent, 1¾*d.* to 3¾*d.*
BALATA—Sheet, 4/3; block, 3/2½ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 54/- to 62/- per cwt.; Grenada, 48/- to 53/-; Jamaica, 47/- to 51/6.
COFFEE—Jamaica, 30/- to 90/-.
COPRA—West Indian, £26 to £26 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 21*d.* to 26*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 52/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
HONEY—26/- to 31/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/4; concentrated, £18 10*s.* to £18 15*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
RUBBER—Para, fine hard, 10/-, fine soft, 9/4½; fine Peru, 9/10 per lb.
RUM—Jamaica, 1/11 to 5/-.
SUGAR—Crystals, 18/- to 19/9; Muscovado, 13/9 to 14/3; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 24, 1910.

CACAO—Caracas, 11c. to 11¼c.; Grenada, 10⅞c. to 11½c.; Trinidad, 11c. to 11½c.; Jamaica, 9c. to 10c. per lb.
COCOA-NUTS—Jamaica, select, $26·00; culls, $15·00 to $16·00; Trinidad, select, $26·00; culls, $15·00 to $16·00 per M.
COFFEE—Jamaica, ordinary, 8⅝c.; good ordinary, 9c.; and washed, up to 10½c. per lb.
GINGER—9½c. to 12½c. per lb.
GOAT SKINS—Jamaica, 55c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—$4·00 to $5·00 per box.
LIMES—$5·50 to $5·75.
MACE—29c. to 36c. per lb.
NUTMEGS—110's, 9c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 4·24c. per lb; Muscovados, 89°, 3·74c.; Molasses, 89°, 3·44c. per lb., all duty paid

Trinidad.—Messrs. GORDON, GRANT & Co., July 9, 1910.

CACAO—Venezuelan, $11·20 per fanega; Trinidad, $10·90 to $11·25.
COCOA-NUT OIL—$1·11 per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—No quotations.
ONIONS—$2·20 to $2·50 per 100 lb.
PEAS, SPLIT—$6·25 to $6·30 per bag.
POTATOS—English, $1·80 to $2·00 per 100 lb.
RICE—Yellow, $4·35 to $4·40; White, $5·00 to $5·10 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., July 16, 1910; Messrs. T. S. GARRAWAY & Co., July 19, 1910; Messrs. JAMES A. LYNCH & Co., July 11, 1910.

ARROWROOT—St. Vincent, $3·50 to $3·75 per 100 lb.
CACAO—$10·75 to $11·50 per 100 lb.
COCOA-NUTS—$18·00.
COFFEE—Jamaica and ordinary Rio, $9·50 to $11·00 per 100 lb., scarce.
HAY—$1·20 to $1·40 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·25 to $3·00 per 100 lb.
PEAS, SPLIT—$6·10 to $6·25 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $2·25 to $2·75 per 160 lb.
RICE—Ballam, $4·90 to $5·35 (180 lb.); Patna, $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, July 9, 1910; Messrs. SANDBACH, PARKER & Co., July 8, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$8·00 per 200 lb.	$8 00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c per lb.	10c. to 11c. per lb.
CASSAVA—	$1·20	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$3 80 to $4·00 per bag of 168 lb.	$3·80 per bag of 168 lb.
Green Dhal	$5·00	——
EDDOS—	$1·32	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	2¾c. to 3c.	2¾c.
Madeira	—	No quotation
PEAS—Split	$5·75 to $5·80 per bag (210 lb.)	$5·80 per bag (210 lb.)
Marseilles	$4·00	No quotation
PLANTAINS—	12c. to 48c. per bunch	——
POTATOS—Nova Scotia	$2·75 to $3·00	$3·00
Lisbon	No quotation	No quotation
POTATOS—Sweet, Barbados	$1·80 per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00 to $5·50	$5·00 to $5·50
TANNIAS—	$1·68 per bag	——
YAMS—White	$2·40	——
Buck	$3·84	——
SUGAR—Dark crystals	$3·00 to $3·05	None
Yellow	$3·60 to $3·70	$3·70
White	$4·00	$4·00 to $4·25
Molasses	$2·25 to $2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Value of Agricultural Experiment Stations.

ATTENTION has been drawn recently * to the fact that the properly conducted agricultural experiment station derives its value chiefly in two ways: from its use in providing assistance of more immediate moment to the practical agriculturist, and from the general results that are obtained, by its means, through the carrying on of research. The true nature and extent of this value are often imperfectly realized, or indeed ignored, and it is the purpose of the present article to indicate, to some extent at least, wherein the existence of this value lies.

The broad aim of the experiment station is to provide assistance by means of discovery and acquisition. The discovery, or the thing acquired, may be of a concrete or an abstract nature. That is to say, the work that is carried on may lead to the recognition of useful principles in relation to its problems, or to the production of actual agricultural apparatus, strains of plants, etc., which will be beneficial to those whom its labours are intended to serve. As regards the methods of acquisition, the knowledge of what is being done at other stations may have advantage taken of it by the application of principles that have been formulated at these, or the acquirement from them of actual things that will be of use in the district for which its efforts are made, such as, again, valuable mechanical aids in agriculture, and new plants. Without an experiment station, the worth of results obtained by others cannot receive proper consideration, in reference to the conditions which obtain in a particular locality, and those who are resident there have no one to advise them when attention is being given to proposals to introduce new plants, machinery, or other substantive means of assistance.

Several ways exist in which the work carried on at an experiment station may give rise to discoveries that may or may not be of direct use, but every one of which has its value sooner or later. The most general way in which these discoveries are made is as the result of direct search; they sometimes occur in an accidental way, while this search is being made. In other cases, they arise from the reconsideration of old

*_Agricultural News_, Vol. IX, Nos. 209 and 210.

work in the light of that which has been done more lately. Finally, it is not unimportant that they may be made through the following of suggestions that have come into being, through the work that is done at other stations.

Proper recognition of these matters, and of other circumstances that have already received consideration in the articles of which mention has been made, will make it evident that the experiment station must never be made a means for the performance of hasty and ill-considered work, and that such an institution must never be regarded as a factor of temporary importance in the agricultural history of a community. Agriculture, regarded as a science, is new, so that time is required before its problems will be outlined as definitely, or the knowledge concerning it made as systematic, as is the case with the older sciences. It is not sufficient to give time merely for the discovery of empirical results, important though these may be in their particular application; the explanation of them must be provided, so that they may become a means of adding to the sum of knowledge that is useful, in the widest sense.

There are other, more restricted, ways in which it is made evident that attempts to solve agricultural problems in periods of time that are insufficient for their proper study will lead to work of inferior value, or even to that which is useless. The results of such labour are, in any case, very likely to be unsatisfactory, and the knowledge of their application incomplete, so that if they are to become of value, the work will have to be revised—a contingency that will make its cost many times greater than if it had been conducted with due regard to the planning and care necessary to give it worth. Where there is undue haste to obtain and publish results, these are likely to require revision, and the manner of their publication will leave much to be desired.

There is thus the great necessity for patience, both on the part of the workers in an experiment station, and on that of planters, whose interests they are there to serve. This necessity is often forgotten, so that the lack of recognition of it causes want of interest in the work, and has even led, in some instances, to suggestions which, if followed, would have put an end to the work of the station. It is such an attitude of mind which hasbeen known to give the idea that all agricultural experiment stations should be of the nature of model farms, which should only possess one means of justifying their existence, namely the ability to produce a balance sheet showing a profit, at the end of each year of working. What has been said already in these articles should be sufficient to show that stations of this kind could not undertake experiments of the widest and most useful application, and very little consideration will be necessary to demonstrate that the method, just outlined, of estimating their usefulness is utterly fallacious and unfair.

From its very nature, the experiment station cannot possess its value in virtue, simply, of what happens within it. Its effect on the agricultural conditions outside of it is obviously the true indication of its worth. What does it do toward ameliorating those conditions, even when its influence is being considered in the narrowest way? It helps the agriculturist to save money and to gain it. In the first way, it prevents him from wasting his substance on useless trials of expedients for enabling him to continue his work or make it more profitable; in the second, it suggests and introduces methods and means for the more successful pursuance of the agricultural calling. These circumstances of its usefulness cannot appear on the balance sheet of its working, but they will have their effect in the increased prosperity of the district which it serves, even though many of those who share in it may not have attained to a complete recognition of the true cause of this increase.

These narrow considerations fall very short of giving suggestions by which the true value of agricultural investigation may be gauged. By its aid, discoveries are made which, in cheapening production or in protecting the different phases of the industry from destruction, have their value for all time. The power of making such a discovery is present wherever investigations of that nature are being carried out, and the possession of this power gives most of the necessity for its existence to every station, while the realization of results from it makes the value of such existence incalculable. Nothing more need be said in regard to the question as to whether agriculturists throughout the world, can afford to allow the number of such stations to be lessened. It will not become less, if their value is truly recognized. Those who do recognize it will, on the contrary, desire that the possibilities of good through them are made increasingly larger.

It is to be kept in mind that Nature does not respond to attempts to hasten the giving up of her secrets. Their slow discovery allows time for the rejection of mistaken ideas, and therefore for the better use of them when they are no longer hidden. One of

these—the manner in which leguminous plants obtain nitrogen from the air—was first investigated reasonably by Boussingault, but it was not made plain until sixty-three years later. There are others, of equally far-reaching importance, awaiting discovery; and mankind cannot afford to stop to count the annual cost of the attempts to find them out—far less, through impatience, to decrease the means by which they are brought to light.

SUGAR INDUSTRY.

SUGAR-CANE IN PORTO RICO.

A series of articles by D. W. May, Special Agent in Charge of the Agricultural Experiment Station, Porto Rico, on the sugar-cane in that island, is appearing in the *Porto Rico Horticultural News*. The following extract is taken from the second article of the series, given in Vol. III, No. 6, p. 95, of this journal:—

At the experiment station the following varieties have given excellent results: D.95, D.117, B.347 and B.1355. As resistent to drought, T.77, D.117, B.347 and B.3289 have done well on the south side of the island. At the Central San Christobal, on the east end of the island, the preliminary test of the seedling canes has been very satisfactory, and so far as tested, they are ranked as follows: T.77, B.3,289, B.347, D.117 and D.95. In Louisiana, D.74 is highly considered. In Porto Rico, however, while very sweet, this cane does not grow large, as it ripens early. It is well suited to a short growing season like that in Louisiana. The Guanica Centrale, on the south side of Porto Rico, has several hundred acres of seedling canes growing. The following results obtained there are of interest and value.

In this district, canes were planted on October 1, 1907, 5½ by 5½ feet, and harvested on December 22 and 23, 1908. All varieties were fertilized, irrigated and cultivated alike.

Comparative test of cane at Guanica Centrale:—

Variety.	Yield per acre.	Density.	Sucrose.	Quotient of purity.	Glucose.	Glucose ratio.	Fibre.
	Tons.	Brix.	Per cent.		Per cent.		Per cent.
Otaheite (a)	56·38	15·7	12·7	80·9	2·00	15·8	9·50
T.77	65·42	18·2	15·1	83·0	1·61	10·7	9·95
D.117	56·45	18·5	15·4	83·2	1·69	11·0	11·80
D.95	52·77	18·1	15·8	87·3	1·51	9·6	10·05
B.1753	52·99	16·3	12·8	78·5	1·89	14·8	12·10
Christalina (b)	52·08	16·9	13·4	79·3	1·79	13·4	9·65
D.74	49·01	19·9	17·6	88·4	1·43	8·1	10·85
W. Bamboo	47·52	16·9	13·2	78·1	2·17	16·4	10·70
Tibboo Merd	43·46	16·3	13·6	83·3	1·79	13·2	10·30

At Hacienda Montserrate, the following varieties of cane were planted on September 25, 1907, and harvested on December 28, 1908. All varieties were fertilized and cultivated alike.

(a) Control plot. Attacked by fungus disease (*Marasmius sacchari*).

(b) Slightly attacked by fungus disease (*Marasmius sacchari*).

Comparative test of varieties of cane at Hacienda Montserrate:—

Variety.	Yield per acre.	Density.	Sucrose.	Quotient of purity.	Glucose.	Glucose ratio.	Fibre.
	Tons.	Brix.	Per cent.		Per cent.		Per cent.
W. Bamboo	64·66	16·9	13·0	76·9	1·85	14·2	10·6
D.117	64·60	17·5	15·0	85·7	1·79	11·9	11·0
B.347	60·24	17·8	15·3	85·9	1·96	12·8	9·45
Tibboo Merd	52·51	16·1	14·2	88·2	1·72	12·1	11·3

In Louisiana, splendid results have been obtained by the introduction of D.74 and D.95, two Demerara seedlings. The *Louisiana Station Bulletin*, No. 78, gives the history of these seedling canes, and the results of tests conducted from 1894 to 1903 are reported. In every instance, the two seedlings were lower in glucose content than the home canes. A low glucose content is of great advantage in working the juice. D.74 gave especially favourable results in this respect. The average on analysis showed that this seedling contained 1·8 per cent. more sucrose, and D.95 0·9 per cent. more than the home canes. D.74 yielded 5·68 tons of cane more per acre than the two native varieties, while D.95 was about equal to them in cane production. The financial results are based on a value of 4c. per lb. for yellow clarified sugar, giving half to the producer of the cane and half to the manufacturer of the sugar. On this basis, the crop of plant canes and first year's ratoons of D.74 gave an average increase of $39·70 per acre, and D.95 of $21·81 over the home canes. With the plant canes of the first, second and third ratoons, the figures were $26·28 and $28·14 per acre, respectively. The results obtained in the mill showed a marked superiority of D.74 over the three other canes, although D.95 gave better returns than the two native sorts. In total extraction, D.74 showed an increase of 7·87 per cent., or nearly 11 per cent. in the juice, over the home canes. A summary of the results gives an increase of 2·34 per cent. in extraction, and of 40·7 lb. of sugar, per ton of cane ground, in favour of the seedling canes. Co-operative tests made by twenty-seven planters throughout the State confirmed the results obtained by the station. D.74 is more vigorous, a more rapid grower, gives a larger tonnage, is an erect cane, and on this account is believed to be more economical in harvesting; ratoons well, if not better than home canes, gives a larger extraction, and has a larger sugar content, yielding more sugar per ton and giving a greater tonnage per acre than home canes. The same remarks, in a less degree, apply to D.95.

At the Hawaiian Sugar Planters' Station in 1906, 5,232 seedling canes were grown. Of 279 raised from West Indian seed imported in 1904, 37 have been sufficiently promising to merit special testing on the station grounds. Tests of varieties in 1903 show D.117 at head of list with 333,670 lb. cane, yielding 43,010 lb. sugar per acre.

Information has been received concerning the new centre of shipping and manufacturing activity which is being formed midway between Grimsby and Hull, by the Great Central Railway Company, through the establishment of the Port of Immingham, with special docks, the object being to provide an additional port on the east coast of England. This is contained in a pamphlet, which may be obtained on application to the Publicity Department, Great Central Railway, 216, Marylebone Road, London, N.W.

FRUITS AND FRUIT TREES.

SELECTION OF COCOA-NUTS FOR PLANTING.

A series of articles on the cocoa-nut palm in French West Africa is appearing in *L'Agriculture Pratique des Pays Chauds.* The following information, dealing with the selection of nuts for planting, is translated from part of the instalment which appears in the May number of this journal:—

The excellent results that are derived, in the different branches of agricultural production, from the selection of seed, are well known. More especially, this gives a means, to a very large extent, of increasing the yield, improving the quality of the product, making the plant more resistant to untoward climatic conditions, and to the attacks of diseases and insects. Applied in the case of the cocoa-nut, this method has all the greater interest, because the plant occupies the soil for several years, and if there is not great care to take every precaution for the purpose of obtaining healthy, vigorous and productive trees, the ill effects of negligence at the commencement will be repeated every year, and will make themselves felt in a serious manner.

In regard to this matter, the planter may find himself in several different sets of circumstances, depending on whether he is working in a region where cocoa-nuts for sowing cannot be obtained on the spot, or whether he has at his disposal plants which can provide him with all that he requires for sowing purposes.

In the first case, he cannot make a selection, in the widest sense of the word. He has to be content to effect a choice among the nuts which he has obtained from regions which are often distant from him, and he is unable to ascertain for certain, the origin of his planting material.

According to Prudhomme, the greatest precautions must be taken in this case. The selection should be commenced by taking all the nuts of which the form and size approach most nearly to those of the variety which is being planted. If it is a matter, on the other hand, of a mixture of many kinds, the qualities of which are only slightly known, it is necessary first to break several of the nuts, so as to get an idea of the worth of each kind in connexion with the yield of fresh copra, in order to be in a position to eliminate those which are of the least value. In those cases, though these are rare, where it is not possible to conduct an examination of this kind, the planter must be contented with reserving for sowing purposes all the nuts which are of medium size and of regular shape. In this way, the nuts will have to be examined one by one for the purpose of ascertaining, by means of the odour, the appearance, the sound and the feeling, the degree of maturity and freshness, and choosing in preference the heaviest fruits, with a smooth skin and without blemish.

The way in which it may be found out if a nut is ripe will be indicated later. Traces of mould around the place of attachment of the stalk show most often that the fruits have been gathered before becoming matured: such fruits should not be used.

When the planter is working in a region where the cocoa-nut palm grows naturally, the first stage in its selection will have relation to the trees. According to Prudhomme, again, the nuts which are to be used for sowing should have been produced by very healthy and vigorous trees, at the middle of the life-period, that is to say, by those which are about twenty to twenty-five years old; such trees should be of rapid growth, producing abundant crops of good quality. In addition to this, it is advisable to choose for the purpose, as far as possible, seeds from plants which are growing on a soil resembling as nearly as possible that of the plantation which is being made, and to avoid too great differences between the climate of the locality where the plants have to grow, and that of the place where the seeds were produced.

It should be added that, in consideration of the difficulties connected with the harvesting of the nuts, the seed nuts should be collected from plants possessing a short stem.

The second stage will have relation to the nuts produced by the chosen trees. It has been indicated above what considerations should be taken as a guide in selecting these. In addition to what has been said, Prudhomme recommends, in most cases, a choice, in preference, of nuts possessing a mesocarp which is only slightly thick, especially in countries where the production of coir is not likely to be of any great extent. This recommendation appears to possess a definite importance, especially where it is intended to make a plantation on a poor soil, because the fibrous coverings of the nut take up a large part of the nutritive material absorbed by the plants. On lands which are better endowed, this precaution becomes less indispensable, for in every well kept plantation, these coverings should form a valuable means of making a return

to the soil, either directly or through the cattle pen; that is if it is not desired to make an industrial use of them. The employment of the largest nuts for planting is sometimes strongly recommended; it seems in most cases that planters do not agree with this, thinking that the better plan is to give the preference to nuts of medium size. In a general way, the largest fruits are naturally produced by healthy and vigorous trees; but the number given is relatively less considerable; in addition, it is not rare to see cocoa-nut plants, with fruits of medium size, giving a total crop which is larger than that from a variety having big fruits: for that which is lost in volume is almost always compensated for largely by the number of nuts obtained. It has been noticed equally, that the very large nuts are provided with a very thick coir, and on the other hand, the nut proper only contains a thin layer of albumen. These nuts belong more particularly to the kind that is useful for drinking purposes. They please the eye but do not always merit the planter's attention.

An idea of the thickness of the fibrous envelope can be easily obtained by pushing a knife blade into it.

A final condition of the very first importance that should be fulfilled by seed cocoa-nuts is that of being perfectly ripe, but not dry. Prudhomme points out that a means of discovering if the stage of ripeness has been attained is provided by shaking them. The water, which they still contain in small quantity, will cause a clear sound which is very easily heard, and which diminishes in intensity on the commencement of germination. Imperfectly ripened nuts, on being shaken, give only a dull sound, which very little experience serves to distinguish from the former one. Nuts which have arrived at complete maturity while still on the tree should always be preferred to those which have been left to ripen in the shade after having been cut.

Some kinds of nuts, even when ripe, contain a fair amount of water, and it is necessary to dry them before sowing, for if they are put into the earth immediately, there is a chance that they will rot before they germinate. Drying should be conducted in the shade; exposure to the sun may produce a partial baking of the kernel, which will interfere with germination.

HALF-YEARLY EXAMINATION OF AGRICULTURAL SCHOOLS.

The following are the general reports of the Examiner (Mr. F. W. South, B.A.) on the recent half-yearly examinations of the pupils at the Agricultural Schools in Dominica, St. Vincent and St. Lucia:—

DOMINICA AGRICULTURAL SCHOOL.

Sixteen boys sat for this examination. Of these two were seniors and fourteen juniors. The average percentages of marks obtained were as follows: seniors 76·9: juniors 63·2. The standard of both the seniors and juniors shows considerable improvement on last time. Marie was the best senior and Balthazar the best junior; but Defoe, E. F. Francis and N. Abraham also did well.

There was a very marked improvement in the Arithmetic of the juniors and in the general appearance of the papers, though attention should still be paid to the points mentioned in the special report on the junior Dictation papers and to handwriting and grammar generally. Of the other subjects, the Chemistry of the seniors leaves room for improvement, and the marks obtained by the juniors in the Geography paper were poor, as the paper was of such a nature as the boys should have been capable of answering well.

On the whole, the result of the examination was quite satisfactory, and indicates that the boys are receiving careful instruction.

ST. VINCENT AGRICULTURAL SCHOOL.

Twenty boys sat for this examination. Four were seniors, ten juniors, three new boys and there were three probationers. The average percentages of marks obtained were as follows: seniors 75·5; juniors 61·3; new boys 61·9; probationers 59·8. With the exception of the seniors, these averages show an improvement on those obtained at the last examination, especially in the case of the new boys. The work of the seniors was not so good as that sent in for the December examination. David Derrick was again the best of the seniors. Floris Simmons also sent in good papers. Of the juniors, Bradshaw and Davis were practically equal, while the two Haynes also did fairly well in this class. B. Derrick was the best of the new boys and Otto Kirby the best probationer.

English and Spelling were fair in the senior and junior classes, but somewhat weak in the answers of the new boys and probationers; the writing throughout was neat, and the diagrams were good. The Arithmetic of the seniors was again excellent, and that of the juniors showed very marked improvement on last time's result. This subject was also well done by the new boys and probationers. The Agriculture of the new boys and probationers requires attention and the same is true of the Botany of the juniors. The Chemistry paper might have been better answered by both seniors and juniors, and the Geography of these two classes left room for improvement. The new boys and probationers, with the exception of Isaac Phills, displayed an almost complete ignorance of the last-mentioned subject.

On the whole, the results of this examination are satisfactory, and it is clear that the pupils are receiving very careful attention.

ST. LUCIA AGRICULTURAL SCHOOL.

Eleven boys sat for this examination. Of these nine were seniors and two juniors. The average percentages of marks obtained were as follows:—seniors 63·3; juniors 43·8. The result for the seniors was fair, but the two juniors were very weak throughout. H. Auguste was the best of the seniors: G. Moise also sent in good papers.

With regard to the English subjects, the Grammar of the seniors requires attention. The handwriting and general appearance of the papers were satisfactory. The Arithmetic of both classes, more especially the juniors, was not nearly so good as last time, and the Chemistry of both classes was distinctly weak. The juniors did not appear to have covered the schedule laid down by Mr. Stockdale. Geography also requires attention. Greater care should be exercised in drawing diagrams, which should be of sufficient size to show clearly the points required. More detailed information with regard to the different subjects is contained in the separate reports.

It would appear that the somewhat less satisfactory results obtained at the examination are in part due to the very rapid promotion which has been necessary, and are no reflection on the quality of the teaching that the boys have received.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 18, with reference to the sales of West Indian Sea Island cotton :—

A very limited business has been done in West Indian Sea Island cotton since our last report, chiefly confined to St. Vincent cotton from 20*d.* to 24*d.*

Spinners are withholding from the market and prices have a downward tendency. We hear, however, that the American Sea Island crop is not doing so well, and if the weather does not improve, spinners will enter the market again.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 2, is as follows:—

Since our last report on June 11, the market has remained dull, with no demand. The stock in Factors' hands is now reduced to 53 bales, consisting principally of Planters' crop lots, held at 50c. to 55c. There is also still left on plantation around Beaufort about 100 bales of Fully Fine.

Although the season has practically closed, yet it is possible that some demand may spring up for the limited supply left unsold, which may be required by the trade before the next crop comes to market.

INDIAN COTTON IN THE UNITED STATES.

In the current volume of the *Agricultural News*, p. 200, a note appeared in relation to the recent importation of cotton into the Southern States, for use in the mills. The report on which the information was based is given in *Diplomatic and Consular Reports*, No. 4,416, Annual Series, from which the following extract relating to the matter is taken :—

Owing to the unusually high prices prevailing in this country for cotton during the later months of 1909, several hundred bales of cotton were imported from India by several of the Carolina cotton mills, to be used as an experiment in combination with United States-grown cotton. This, it is stated, is the first time in the history of the southern mills that Indian-grown cotton has been purchased. The orders for the above-mentioned cotton were placed by the Townsend Twine Mills and the Pelzer Cotton Mills, both of South Carolina, and it is understood that other mills in the Piedmont section of this State have done likewise. Indian cotton is of a somewhat shorter staple than the domestic-grown Upland cotton, but it is said to be equally white and smooth. The Carolina mill owners are going to experiment with this Indian cotton, and if it prove satisfactory, as they seem confident it will, and present high prices for domestic cotton continue, it is believed larger orders for the Indian article will soon be placed.

In the present instance, the Indian cotton was bought f.o.b. at New York at $11\frac{1}{8}$c. ($5\frac{3}{16}d.$) per lb.; the freight from New York to the Carolina mills was 56c. (2*s.* 4*d.*) per 100 lb.; the cotton therefore was laid down at the mills at a cost of $11\frac{3}{4}$c. ($5\frac{7}{8}d.$) per lb., while prices for domestic cotton of equally good grade for mill uses was quoted at $14\frac{1}{4}$c. ($7\frac{1}{8}d.$) at the mills at the time the Indian cotton was bought, with little prospect of any early decline.

Although, as above stated, the importation of Indian-grown cotton is new here, yet it is well known that the Southern mills have for a long time imported and used cotton from Egypt, because, for certain purposes, it has been found to answer as well as the American Sea Island cotton, and can be obtained at less cost; but the importation of short cotton by the Southern mills was practically unknown until the last season.

The fact that the cotton has been brought from India into the very home of short staple cotton has excited comment and interest in cotton-manufacturing circles, as it opens a field for speculation as to the effect such importations are likely to have upon the cotton-growing industry in this and other countries. The questions naturally arising are: whether it will further stimulate the production of Indian cotton, and to what extent; and also whether it will increase present efforts to find other cotton-growing areas elsewhere. The solution of the problem will, perhaps, depend largely on whether present high values for short staple cotton are likely to be maintained or not for the future, at least so far as Indian imports of any considerable amount are concerned.

In the *Annual Report on the Experimental Work of the Surat Agricultural Station*, India, for 1908-9, particulars of manurial experiments with cotton and other plants are given. The trials have been carried on for four years, the manures being applied in the first three of these, on plots measuring $\frac{1}{6}$-acre in area. The results showed, with regard to cotton, that the yield may be very greatly increased by the use of farmyard manure and castor cake, as well as by means of dressings of sodium nitrate and superphosphate. There was no profit from the increase, however, after allowance had been made for the cost of the manure, except in the case of farmyard manure, though castor cake, if cheaper, could be used economically.

THE MANUFACTURE OF PAPER FROM MEGASS.

In view of suggestions that have been made recently, in connexion with the manufacture of paper from sugar-cane fibre, the following extracts from an article by William Raitt, Chemical Engineer and Fibre Expert, Bangalore, in the *Tropical Agriculturist*, Vol. XXXIV, No. 1, p. 11, are of interest:—

Bagasse or megass, the refuse crushed sugar-canes or chips from the diffusion batteries, has come into some degree of prominence of late as a possible raw material for paper. It may therefore be useful to consider, from the collective experience available, modified or confirmed by our own, how far the hopes held out regarding it in some quarters are likely to be justified. The growing scarcity of wood-pulp in Europe and America is giving occasion for a great amount of research and experiment with the object of finding a suitable substitute, and while several have been suggested which combine all the advantages necessary to a commercial as well as a technical success, it is to be feared that an insufficient acquaintance with the scientific and economic problems evolved, has resulted in others being brought forward which hold out very little prospect of practical usefulness.

It may be as well, first to enquire as to what grade or class of raw material is wanted in supplement of, or in substitution for, wood-pulp. For this purpose, paper may be broadly divided into three main grades, corresponding fairly accurately with the principal divisions of the raw material market:—

(1) The best qualities of writing paper—manufactured almost wholly from linen and cotton rag.

(2) Inferior writing paper, book printing and news paper—manufactured mainly from wood-pulp.

(3) Coarse unbleached paper, wrapping and packing paper—manufactured from textile wastes, old sacking and such like materials.

Now the growing demand for a new material arises solely from No. 2, since rag is now reserved almost exclusively for No. 1; the supply is quite adequate to the demand, and, apart from this, no other material is likely to be found which, at the same cost, combines the necessary requirements of strength and colour. For No. 3, where strength only is required, the market is also fully supplied, and the steady development of textile industries, with the resultant continual increase in the output of wastes, seems likely to keep it so.

The stage at which sugar-cane holds its maximum saccharine contents appears to coincide with a state of partial and irregular maturity of the fibre. While the fibres on the outside, or just under the skin of the cane are firm, long and of good strength, though somewhat harsh, those from the interior are short and weak. It therefore presents the most difficult of problems to the paper maker. Since the chemical treatment must be uniform, it follows that it must be severe enough to reduce the outer fibres completely, thereby largely destroying the inner ones, or it must be mild enough to conserve the latter and leave the former only partially resolved into pulp. In the first case, the yield is largely reduced, and what remains is expensive to bleach, because the severity of the treatment has degraded the weaker fibres into insoluble brown compounds, which stain the pulp. In the latter case, the yield is good, but the product is almost equally difficult to bleach satisfactorily, because of the admixture of partially digested outer fibre. The pulp is consequently full of specks and blotches, unfit for anything but the commonest bleached paper, and that only in conjunction with some better and more uniform material.

We do not think, then, that bagasse can be seriously considered as a candidate for class 2, but there are localities it which it may find a very profitable entrance into class 3.

Cane-sugar factories are usually situated in localities where all manufactured goods have to be imported at a considerable cost for freight, and, probably, import duties also. Where such circumstances exist, together with a sufficient local demand for unbleached wrapping and packing papers, or even for the thin unbleached paper so largely used by the natives of India and elsewhere for correspondence and accounts, it is quite possible to show that a paper mill may prove a very profitable auxiliary to a sugar factory, and that the bagasse may be worth considerably more for this purpose than its present fuel value.

A paper mill suitable for this class of paper, to produce 40 to 50 tons per week, would cost roughly, £20,000. A conservative estimate of the cost of production, under average conditions, exclusive of the fuel value of the bagasse but including repairs, depreciation and 50 per cent. interest on cost of plant, amounts to £10 10*s.* per ton. Under the conditions above referred to, the product should be worth £15, leaving £4 10*s.* as the paper-making value of the 2¼ tons of bagasse required to produce it, or say £2 per ton. The cost of steam coal to replace it in the sugar factory furnaces would be at the outside, £1 10*s.* per ton. In calorific effect, a ton of good steam coal is usually assumed to be equal to 4 tons of bagasse, so that the full value of the latter cannot exceed 7*s.* 6*d.* per ton. Deducting this, there remains an estimated profit of £1 12*s.* 6*d.* per ton of bagasse converted into paper.

THE TICKS OF JAMAICA.

The *Annals of Tropical Medicine and Parasitology*, Vol. III, p. 21, contains an account of the ticks and other blood-sucking Arthropoda of Jamaica, by Professor R. Newstead. From an abstract of this, which is given in the *Experiment Station Record*, for May 1910, it appears that six species of ticks which occur in Jamaica are considered, all of which, except the fowl tick (*Argas persicus miniatus*) were found by the writer. The cattle tick (*Margaropus annulatus australis*) was found to compose 90 to 95 per cent. of the ticks found, so that it is by far the most abundant in Jamaica. Particulars are given concerning *Rhipicephalus sanguineus*, which attacks dogs, and of the tropical horse tick (*Dermacentor nitens*). The second position as regards abundance in the island is taken by *Amblyomma cajennense*, which is a great pest to man. Another species of this, *A. maculatum*, was collected also, as well as *A. dissimile*, which was obtained from the so-called bull frog (*Bufo marinus*). Even lizards were found to be attacked by ticks, a specimen of *Aponomma* sp. having been taken from one of these animals (*Anolis* sp.). A fact of particular interest is that Mysore cattle show an almost complete immunity from attacks by ticks; these parasites seem to prefer as hosts, cattle containing little or no Indian or Spanish blood.

The natural enemies of ticks which are found in Jamaica are stated to be the savannah blackbird (*Quiscalus crassirostris*), which is closely related to the Barbados blackbird (*Q. fortirostris*); the savannah or parrot-billed blackbird (*Crotophaga ani*), which is also found in some of the Lesser Antilles; the domestic fowl, lizards and the bull frog. A discussion of remedial measures is given, which include the burning of pastures and the uses of cattle washes and dips. As has been stated, information is also given concerning other blood-sucking Arthropoda than ticks.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The Value of Agricultural Experiment Stations forms the subject of the editorial. It is treated with special reference to the lasting worth of the discoveries made, and to be made, at such institutions.

Interesting information concerning the sugar-cane in Porto Rico appears on page 243.

An article, commencing on page 244, gives useful facts concerning the selection of cocoa-nuts for planting purposes.

The considerations in the extracts from an article on the manufacture of paper from megass, given on page 247, are of present interest.

Part IV of the series of articles on the Acarina or Mites, appearing under Insect Notes, will be found on page 250.

Useful information in relation to broom corn is given on page 251.

On pages 254 and 255, the Fungus Notes deal with the most recent work that has been done in connexion with the diseases of cocoa-nut palms.

Comparative Values of West African Coffees.

The *Journal d'Agriculture Tropicale* for last June gives information obtained from an article in *Teysmannia*, for March 1910, which presents the results of investigations as to the relative value of three West African coffees, namely *Coffea canephora*, var. *kouillouensis*, *C. excelsa* and *C. robusta*. The samples examined had been prepared by the wet method, and the parchment had not been removed, owing to the want of the apparatus necessary for the purpose.

The account shows that a first trial, made at the end of November 1909, under the auspices of the Colonial Bank of Sourabaya, with samples sold locally by Chinese merchants, showed that the values of the three coffees in the order mentioned above were respectively 34 to 35 florins, 37 florins, and 35·50 florins, per picul.

The following description of the prepared samples has been given by an Amsterdam broker: Kouillou, good berry, imperfectly cleaned, which would be better for the removal of the parchment; taste somewhat acid, wanting in delicacy; worth 26½c. to 27c. Excelsa, strongly resembles the small variety of Liberian; colour yellow, skin brown; taste leaves something to be desired; value 26c. to 26½c. Robusta, berry small, colour uniform, taste satisfactory, value 27c. to 27½c.

The Influence of Forests on Climate and Floods.

The conclusions given in a paper contained in a report presented to the United States House of Representatives, on the influence of forests on climate and floods, are given in the *Experiment Station Record* for May 1910 (Vol. XXII, No. 6). These conclusions show that (1) there is strong evidence that the removal of forests has had no effect in creating or increasing droughts in any part of the world; (2) the amount of rainfall controls the rate of forest growth, but the presence of forests has little or no effect on the rainfall; (3) rainfall is controlled by conditions that exist at such altitudes as to preclude the possibility of there being any effect on it through the presence or absence of forest covering, the buildings in villages and cities, etc.; (4) during the time that accurate observations have been made in the United States, the rainfall has not increased or decreased to an extent worthy of consideration; (5) the cause of floods is excessive rainfall; (6) the area of the upper waters of a river is so small, compared with the total area of the watershed, that except locally in mountain streams, the amount of water flowing will not be sufficient to cause floods, even if the removal of forests allowed the water to run off more quickly; as a matter of fact, if the removal of forests was responsible for general floods over a watershed, it would be necessary, in order to prevent this, to reafforest the lower levels, which are generally already taken up for agricultural production; (7) the flow of the United States rivers is not materially affected by anything but the rainfall; (8) there is no difference between the present levels of the high and low waters and those of former years; (9) the frequency and duration of floods are not greater than they were formerly.

The Pine-Apple Industry of Formosa.

An account of the pine-apple industry of Tainan, South Formosa, which is contained in *Diplomatic and Consular Reports*, No. 4,460, Annual Series, shows that this is not in a very hopeful condition. Work, in fact, was stopped for a time, in 1909. It is supposed that about 840 acres of land are under cultivation for the purpose, but because the circumstance that the price of sugar in Formosa, owing to protection, is from two to three times that in the United Kingdom, fruit preservers cannot compete with foreign producers. The export, to China, of fibre from the leaves, for making grass cloth, showed a slight increase in 1909.

Calcium Cyanamide and Nitrate of Lime.

On pages 169, 185 and 217 of the current volume of the *Agricultural News*, notes have been made of experiments which were undertaken for the purpose of comparing calcium cyanamide and nitrate of lime, as manures, with nitrate of soda and sulphate of ammonia. Further information in connexion with the subject is available in the *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. X, No. 2, which contains an account of an investigation giving results that agree with those that have been noticed already; that is to say, that the power of calcium cyanamide and nitrate of lime to produce increases of crops is very similar to that of nitrate of soda and sulphate of ammonia.

Methods of Sowing Maize.

A comparison of the yields obtained by planting corn in rows, one kernel to each place, with those resulting from planting in hills is made in *Farmers' Bulletin*, No 400, of the United States Department of Agriculture, which has been issued recently. It is pointed out in this that the advantage of the former method is that it gives each plant a fairer chance to develop normally. The latter method possesses the advantage that the corn can be cross cultivated and kept free from weeds, and the whole soil surface maintained in good condition, by means of mechanical tillage.

The experiments that are described all showed that, under different conditions of climate and soil, and with different varieties of corn, better results were obtained by planting the corn in hills, the kernels being spaced 5 inches apart, than by the ordinary method of dropping them close together in each hill. This is because planting according to the latter method results in unnecessary crowding of the stems and roots, so that the plants are weakened and the yield is reduced. It is estimated that, in the United States, the use of seed planters which dropped the kernels separately, instead of all together would add 50,000,000 bushels of corn to the annual production of that country.

The Guava in Mexico.

An account of the occurrence of the guava in Mexico, more especially in the consular district of Vera Cruz, is given in No. 4,464 of the *Annual Series of the Diplomatic and Consular Reports*. Here, it is pointed out that this plant is very common throughout the tropical region, but that little or nothing has been done up to the present to improve it by cultivation. The wild fruit is small and inferior, but if the surrounding vegetation is removed, the trees bearing it will grow to 15 or 18 feet in height, and the size of the fruit will increase considerably. The commonest varieties of the guava in Mexico are the red apple-shaped and the yellow pear-shaped. Of these, the second is the larger, and both are heavy bearers, fruit being produced nearly all the year round. It is suggested that efforts should be made to obtain the improved fruits on a large scale by cultivation, and by allowing the trees a proper supply of light and air.

The Diastases in Rubber Latex.

An article by V. Cayla, in the *India-Rubber Journal* of May 2, 1910, points out that the only group of diastases in rubber latex which have been investigated to any extent is that of the oxydases, and that the only rubber latex on which any important work in this connexion has been carried out is that of *Hevea brasiliensis*. Even here, conflicting results have been obtained, most probably because the material used by different investigators has not been of the same kind, chiefly on account of the changes that take place in latex after its removal from the tree.

The work of the author has shown that not only does the latex of *Hevea brasiliensis* contain oxydases, but that all those tested by him in the fresh state and under indentical conditions, may contain an oxydase which is capable of undergoing oxidation in the presence of air (an oxygenase), a peroxidase or a catalase. The activity of the oxydases usually results in the formation of an acid; it is therefore likely that some latices which coagulate in an acid medium may be caused to do so spontaneously through the activity of an oxydase.

Investigation has shown that oxydases are not the only diastases in rubber latex, for some of them have been found to contain a coagulating diastase, in the fresh latex, which acts like rennet. Attempts have been made to find a diastase in latex which is capable of digesting the albumen present, but without success so far, though this is probably more on account of the delicacy of the investigations than the actual absence of a diastase.

The conclusion is reached that, as it has been shown that a coagulating diastase is present in the latex, it appears possible that the diastases may be, under certain conditions, able either to cause or assist in the spontaneous coagulation of certain rubber latices. This demonstrates the importance of ascertaining all the natural processes in the spontaneous coagulation of latex, in order that a rational means of coagulation may be found.

INSECT NOTES.

THE ACARINA OR MITES.

PART IV.

IXODIDAE (*continued*). Many remedial measures have been tried for the control of ticks, and washes and other applications have been advised for their destruction. In the West Indies, the practice of picking or scraping ticks from infested animals is often resorted to, but this method is attended with serious disadvantages. The construction of the mouth parts of the ticks gives them such a secure hold on the skin of the host, that if an attempt is made to pick off the tick, the body often separates, leaving the head attached. This is obviously a wrong proceeding, especially if there are many ticks picked off in this way, for the mouth parts of each form a point of irritation, even after blood-sucking ceases. When the ticks are scraped off it also results in serious injury to the skin of the host, since this practice causes the production of a great number of open wounds, which may be infected by any disease-producing organism, or even by large insects such as the screw worm.

The use of solutions containing soap, oil, sulphur, or arsenic has been extensively tried, and they have been applied by means of a sponge or brush, where only a few animals have had to be treated, and, by means of dipping tanks, when used in dealing with large herds. Perhaps the most satisfactory of all methods for the control of the Texas fever tick is that known as the 'pasture rotation' system, which within the last few years has been put into practice by entomologists in certain of the Southern States. (See *Agricultural News*, Vol. IX, p. 157.)

The value of this method has been fully demonstrated by trials on large areas in the cattle districts of Louisiana and Tennessee. This system is based on an intimate knowledge of the life-history of the cattle tick in those localities. The following general outlines will serve to illustrate the principle involved. This method depends for its success, in the first place, on the fact that the cattle tick is able to live only on a suitable host, and secondly that the ticks do not of themselves travel far in search of food.

An arrangement is made by means of which the cattle may be changed from one enclosed pasture area to others, so that each pasture will be occupied by cattle for a definite period at a certain time in the life-history of the tick. For instance, if the animals are removed from the land on which they have been pastured before the eggs begin to hatch, the entire herd of cattle should be practically free from ticks, but in order that the eradication of ticks should be complete, the herd should be examined later, and removed again to another tick-free pasture, when there has been sufficient time for the few ticks which may be on the cattle to have completed their life-cycle, and to have reached the fully-fed stage.

By having four such enclosures, cattle ought to be rendered tick-free within a year, and by that time the enclosure which was first used should be free from ticks; for all the larvae which hatched from the first deposit on this land will have starved for want of a proper host. The time required for the eggs to hatch, and the young to die of starvation, varies considerably, and observation would be necessary in special districts to establish the exact periods which would give the desired results of this rotation system. Sufficient time should also be allowed before stock is returned to any of the pastures on which this method is being carried out.

In the United States, the time required for the complete period, from the attachment of the seed tick to the dropping of the adult, is from twenty-one to fifty-eight days. The time required for the adults to commence egg-laying after dropping ranges from two to forty days, averaging in summer three or four days. Egg-laying requires six to seventy days, averaging ten or eleven days in summer. The time required for the eggs to hatch varies from seventeen to forty-four days in summer to over one hundred and seventy in the winter season.

In the West Indies, the cattle tick is *Margaropus annulatus australis*, but several other species occur. The gold tick of Antigua is *Amblyomnia variegatum*; this also attacks cattle. Other species of ticks attack a great variety of hosts, including even cold-blooded animals, such as toads and lizards.

The fowl tick (*Argas persicus*, var. *miniatus*), which also occurs in the West Indies, differs in its habits from the cattle tick. It hides during the day, and feeds on the fowls at night. It is a large, flat, greyish tick, which hides in crevices in and about the poultry house, in the same manner as the nimbles, and consequently the same methods of preserving the cleanliness of the house as were suggested for the poultry mites should prove effective in controlling the fowl tick.

TYROGLYPHIDAE. This family of mites is very important from an economic point of view, and includes a large number of species. The individuals are very small in size and inconspicuous in their colour, and as a result, have often been overlooked. On this account, the injury caused by them has often been attributed to insects, which happened to be present, and which, because of their larger size, have been more conspicuous. They breed very rapidly, and thus more than make up for their small size in the amount of damage which they are able to do. They attack a great variety of substances, among which may be mentioned stored foods such as cheese, flour, sugar, ham, and similar materials; hair in furniture, mattresses and pillows; many drugs, seeds, bulbs and roots of plants; and entomological and other museum specimens.

The mites of this family are soft-bodied, light-coloured, and without tracheae; there are generally no eyes, and there is often a distinct suture between the cephalothorax and the abdomen.

The transformations of the Tyroglyphidae are very remarkable. All the species of mites of this family lay eggs often of a large size, from which six-legged larvae hatch. At the first moult, an eight-legged nymph is developed, and the further transformation may be similar to that in ticks. On the other hand, a form is sometimes developed which is known as the Hypopus stage. At one time, mites at this state of development were supposed to be of a distinct species, to which the name Hypopus was given. In this, the mite differs very greatly from the octopod nymph from which it develops. Its body is hard and chitinous, there is no mouth orifice, nor distinct mouth parts; the legs are short and not fitted for walking. On the ventral surface of the body there is a specially developed area provided with sucking discs, by means of which the hypopus is able to attach itself to an insect, or other animal, for the purpose of being transported to another locality. This stage seems to be an especial adaptation for the purpose of migration, and is remarkable, in that the efficiency of this mode of transportation is entirely dependent on the movements of some other creature. If successful in finding a suitable locality, the hypopus is capable of moulting again to the form of an eight-legged nymph, which feeds and develops into the adult condition.

One species of this family is of interest from its connexion with the disease of bulbs, which at one time was a menace to the cultivation of lilies in Bermuda. It is known as the Eucharis mite, and its attacks on lily bulbs were followed by a bacterial disease of a very serious nature. Another species, *Pediculoides ventricosus*, has recently attracted a considerable amount of attention from the annoyance it has caused to human beings in certain sections of the United States. This mite is normally a parasite on a small larva, which attacks the stems of wheat and other grains. It was found that persons who slept on beds made from fresh straw suffered an acute skin affection, which after some difficulty was traced to the presence and action of this species of mite. The straw which was used for making the beds harboured countless numbers of mites which, being deprived of their natural source of food, attacked the skin of those sleeping on the beds, producing very disagreeable results.

BROOM CORN IN ANTIGUA.

A short account of the present condition of the broom corn industry of Antigua has been received from Mr. T. Jackson, Curator of the Botanic Station. In this, after reference has been made to the efforts of the Agricultural Department to establish the industry there, and to the resulting trials of the crop that have been made by planters, information is given to show that, in the latter, the greatest area planted in broom corn has been about 3 acres, from which 5,726 lb. of corn was reaped, giving 3,708 lb. of seed and 1,758 lb. of heads. These figures show that the proportion of seed to heads, was very high.

The corn was made into 9 bales, varying in weight from 161 lb. to 228 lb, which were shipped to Messrs. T. S. Simms & Co., Ltd., St. John, N.B., who bought the corn at 7½c. per lb. A report received from this firm shows that the corn was too short, none of it being self-working, and that it possessed an objectionable red colour. The first of these characteristics can be altered easily, for one of the faults of broom corn, in Antigua in the past, has been its length, and the efforts made to rectify this have led to too great a reduction of it. The second fault cannot be eliminated as easily, though much may be done by reaping the crop early. It is pointed out in the account that the results of this trial, which is probably the first serious one in Antigua, are on the whole, not discouraging, and that further efforts are likely to be made in the future.

In regard to the handling of the crop, Mr. Jackson gives some interesting facts which have arisen in his own experience. From these, it appears that a simple way of handling the material, after it has been dried, is to tie it up in bundles, each about 1 foot in diameter and with all the heads of the corn on the same side. These bundles are tied in much the same way as is employed for wheat sheaves. During the making of them, the corn should be graded. Care is essential in these matters in order that it may be fed to the cleaning machine in the most efficient way possible. In Antigua, the cleaning machine employed is called the Galesbury Broom Corn Scraper. This requires five to seven labourers (women) to attend to it, who feed the machine, carry the heads to the baling press, and bag and carry away the seeds. By means of this labour, which was provided by those who were new to the work, 518 lb. of broom corn was cleaned in an hour. The chief difficulty in working the machine is that is it very likely to become choked with seeds; this can be avoided by not allowing them to collect in the drum in which the fans revolve.

BRITISH GUIANA AND THE CANADIAN EXHIBITIONS.

The following information as to the exhibits to be forwarded to the Canadian Exhibitions by the Permanent Exhibition Committee of Demerara and others is taken from the *Demerara Daily Chronicle* of July 22, 1910:—

Sugar-cane products. Grey crystals, yellow crystals, white crystals, yellow molasses sugar, samples of rum (coloured and white), and molascuit, besides lengths of sugar-canes for decorative purposes.

Rice. White rice, brown rice, and paddy, with rice in the ear, for decoration.

Cacao. Cacao beans and cacao pods preserved in spirit.

Coffee. Liberian and creole. The Robusta variety is not being sent, as it has not yet become a commercial product.

Cocoa-nuts, etc. Cocoa-nuts in husk and unhusked, cocoa-nut meal for cattle feeding, various samples of cocoa-nut oil, nutmegs, spices, tonka beans, and sowaree nuts.

Lime products. Citrate of lime and green limes are being sent by the Demerara Development Company, and green limes are also being sent by Messrs. Sprostons, Ltd., while Mr. H. R. W. Greig of Haags Bosche has promised samples of different kinds of fruit.

Balata. One sample so far has been prepared, two more have been promised, and an effort is being made to get some good sheets of this product.

Rubber. A biscuit or two of rubber may be sent. Samples of the colony's rubber are being kept for the International Rubber Exhibition in London in 1911, at which, it is hoped, a representative collection both of rubber and balata will be exhibited.

Timber. To each exhibition a representative collection of 20 hand samples of different varieties of the colony's woods is to be sent, besides logs of greenheart, which are being forwarded by Messrs. Sprostons, Ltd., and boards of crabwood by Messrs. Sandbach, Parker & Co.

Samples of locally prepared bitters have been sent by three different individuals.

For decorative purposes, flowering and fruiting spadices of cocoa-nuts and other palms are being sent to make the court as attractive as possible, especially as Mr. C. S. Pickford is arranging that British Guiana will no longer be merged among the exhibits of the West Indies, but will have a stall of its own.

The following have assisted the Committee with exhibits:—

Messrs. Sandbach, Parker & Co., Messrs. Davson & Co., Messrs. Wieting & Richter, Messrs. Curtis, Campbell & Co., Messrs. Sprostons, Ltd., the Hon. B. Howell Jones, Mr. M. P. Camacho, Mr. T. H. Earle, Messrs. d'Aguilar Bros., Messrs. Booker Bros., McConnell & Co., and the Lands and Mines Department.

Information has been received to the effect that the Liverpool University Institute of Commercial Research in the Tropics, which was re-organized a year ago, after having ceased working for a year, has received insufficient financial support for the continuation of its labours. It is therefore being wound up finally, as it cannot be continued, under present conditions. In consequence of the action, the laboratory and all the assets of the Institute have been taken over by the Liverpool School of Tropical Medicine, under the direction of which they will be made use of, in the future.

GLEANINGS.

A report by H.M. Consul at Para shows that the quantity of rubber exported from Para, Manaos, Itacoatiara and Iquitos during May 1910 was 1,643,191 kilos. Of this, 1,373,037 kilos. went to Europe and 270,154 to the United States.

The *Selangor Government Gazette* of April 15, 1910, shows that the weight of cultivated rubber exported from the Federated Malay States during the three months January to March of this year was 2,396,586 lb. The amount for the corresponding period in 1909 was 1,148,269 lb.

A copy of the revised and enlarged edition of the Tariff of Rates for the Conveyance of Goods, issued by Neale & Wilkinson, Ltd., General Foreign Carriers, and Shipping and Insurance Commission and Steamship Agents, of 32, St. Mary Axe, London, E.C. has been received recently. This is entitled the New A B C Tariff of Rates for the Conveyance of Goods and Parcels to all Parts of the World, and a copy of it may be had post free on application.

Cotton cultivation in Beira (Mozambique) has proved very disappointing, notwithstanding the fact that it was undertaken on a large scale by companies with ample capital, possessing expert managers, and provided with modern machinery. One company has abandoned its plantations altogether; and another, while still continuing to grow cotton to some extent, now gives more attention to planting maize. (The *Textile Mercury*, June 4, 1910.)

The report on the Ibadan (Western Province of Nigeria) Agricultural Show, 1910, received from the General Manager, shows that the export of cacao from this Province, during 1909, was 4,276,111 lb., while those of maize and cotton lint were 10,160 tons and 4,775,947 lb., respectively. The rate of the agricultural progress of the Province that is taking place is seen by comparison with the similar figures for 1902, which were: cacao 385,540 lb., maize 60 tons, cotton lint 12,359 lb.

An account of a new patent for the separation of rubber from latex is given in a recent number of the *Financier*, and in the *Tropical Agriculturist* for April 1910. The separation is effected by means of a slowly travelling belt charged with positive electricity, which causes the removal of the rubber from the latex, so that it clings to the belt, from which it is collected by scrapers fixed at a certain point. The exhausted latex can be treated again by passing the belt through it a second time

The *Tropical Agriculturist* for May 1910 gives an extract from the *Fiji Times* of April 6, pointing out that, during the recent hurricane which passed over that colony, sisal hemp plants showed an almost complete resistance to the strong winds. In a few cases, plants had been partly blown over, but these were placed upright, and no interference with their growth appears to have taken place. Some injury was done by the contact of the leaves of neighbouring plants, and the Agricultural Department suggests, in consequence, that these should be placed 10 feet apart, instead of 8 feet, as in the past.

Evidence showing the recognition of an additional rôle probably played by bacteria is adduced in an abstract of a paper given in the *Experiment Station Record* for June 1910. From the work which is described in the article, it is concluded that bacteria form one of the chief causes of corrosion of steel in the soil, as analyses of the rust showed that it contained a large amount of organic matter, and from 1·41 to 3·95 per cent. of combined sulphur (calculated as sulphur dioxide), while the steel before corrosion only contains 0·05 per cent. of sulphur.

H.M. Legation at Buenos Aires reports that the extent of land under cotton in Argentina is very small in proportion to the area of land suitable for its cultivation. Experiments made some years ago showed that the Provinces of Entre Rios and Corrientes, and the territory of the Chaco are suited for this industry. Difficulty in obtaining labour, however, has prevented its progress. It is understood that official encouragement is now being given to the industry. Further experiments made in the Chaco have proved highly satisfactory. (The *Board of Trade Journal*, June 9, 1910.)

The *Monthly Consular and Trade Reports*, for May 1910, gives an account of a method, developed recently in Germany, for rendering hard waters completely soft. It consists in rapidly filtering the water through an artificially made substance called Permutit, by which the lime, manganese, iron and magnesium compounds, which make the water hard, as well as the bacteria it may contain, are, it is claimed, completely removed. Its use is of special importance in the treatment of water for employment in boilers, as such water will leave no incrustation, with the result that cracking will be prevented, the expense of cleaning reduced, and the cost of making the steam lessened.

A pamphlet issued by the Royal Society for the Prevention of Cruelty to Animals, under the title of The Use of Bearing Reins on Horses, has just been received. In it is quoted the opinion of the late Professor Pritchard of the Royal Veterinary College, to the effect that the use of the bearing rein when tightly applied is painful and irritating to horses, is directly and indirectly productive of disease when regularly worn, and by its mechanical action greatly hinders horses from employing their full strength. For the above reasons—on the plea of utility as well as of humanity—its use should be discontinued. It is pointed out that this opinion, supported as it was when it was given by five other professors and over 500 members of the veterinary profession, is an overwhelming condemnation of the bearing rein.

STUDENTS' CORNER.

AUGUST.

Second Period.

Seasonal Notes.

The time has arrived at which young lime plants may be moved to the places to be occupied permanently by them in the plantation. The holes for the reception of these should have been made some time previously. Why? If this has not been done, the soil should be forked, at the positions chosen for them, within a circle which is from 2 to 3 feet in diameter, and in places where the rainfall is heavy, some of it should then be drawn in from the circumference, so that when the plant is put in, the upper part of the root system may be raised slightly above the level of the ground. In choosing the distances that the holes will be made, from one another, several considerations will have to be taken into account, the chief of these being the general conditions of the island in which the plantation is situated, the nature of the soil, the slope of the ground and the elevation above sea-level. Before they are moved to their permanent positions, the plants will require to be cut back to some extent. What is the reason for this? Care will have to be taken that the soil is well drained, in order that the plants may develop properly, be free from disease, and give good crops. Discuss the ways in which the want of good drainage is harmful to plants. It is best that all material used in mulching should be well rotted. Why is this? During the present season, suckers are most likely to be produced. What should be done with these, and why is the procedure adopted? Why are lime suckers usually found in the wet season, and not during the dry time of the year? Distinguish between the 'suckers' of the lime tree and those of the banana and pine-apple. What is the chief use of the latter kinds? Note that the lime crop is commencing, and that the present time forms a good opportunity for making observations on the pests and diseases of this plant. Take special account of scale insects, and make out, as far as you can, the extent to which these are infested by parasitic fungi, and what are the best conditions for this parasitism. Why is it that, although these scale insects can be parasitized, and destroyed, in this way, they sometimes increase to such an extent as to become serious pests and to cause a great amount of loss?

Make a revision of whatever information you have in your possession concerning other citrus fruits. Note that, in planting out budded stocks of oranges and grape fruit, a procedure similar to that for limes is observed. Why is it that, in wet districts, the soil is left under these so that its highest part is situated near the collar of the plant, as was described above in the case of limes?

With the end of the cane-reaping season, attention will be given to the cultivation and care of ratoons, more especially. Where these are tilled in different ways, particularly where mechanical tillage is employed, careful note should be taken of the effect, in the various instances, on the growth of the canes. The interest of such observations will be all the greater where the banks are ploughed, in ratoon cultivation.

Opportunities will be afforded for gaining information in connexion with the application of nitrogenous manures, such as sulphate of ammonia, nitrate of soda, and in some cases, nitrate of lime. How do the effects of calcium cyanamide and nitrate of lime, as manures, compare with those of sulphate of ammonia and nitrate of soda? What are the sources of these manures?

Make careful observations in connexion with the root disease of the sugar-cane, especially in relation to ratoons. Such observations will be undertaken with particular reference to the character of the preceding and the present season; the previous treatment of the fields; the crops grown in them, in the immediate past; the present condition of the soil; the kind of cane growing (plants or ratoons); and the varieties of cane, in connexion with the extent of the attack of the disease. What do you know about the life-history of the fungus which produces root disease, and what preventive measures, if any, are suggested by a consideration of it?

Where the soil is being prepared for onion-sowing, note how this is done. When the seed has been sown, ants often give trouble by carrying away a certain amount of it. Where onions are being grown on a small scale, as in garden beds, or, for planting out, in boxes, these insects may be kept away by sprinkling the soil with water containing one tablespoonful of kerosene to the gallon; the sprinkling should be done just after the water and the kerosene have been well shaken together. Watch the germination of the onion seed, and compare it with that of other monocotyledonous seeds, as well as with that of such dicotyledonous seeds as you have studied. What parts of the plant does the onion of commerce include? Explain what is meant by 'onion sets'. How are they obtained, and what are the special advantages in using them for the propagation of the onion? Compare the structure of the onion with that of other food-storing parts of plants, such as the tuber and the corm. Discuss the suitability of the onion as a catch crop with sugar-cane.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) In what ways is the presence of trees in pastures beneficial? Mention any trees, that you know of, which are suitable for growing in pastures.

(2) State in what way the soil should receive special attention, before artificial manures are applied to it, giving reasons for your statement.

(3) Give an account of the ways in which weeds are capable of injuring cultivated plants.

INTERMEDIATE QUESTIONS.

(1) What is meant by a 'beneficial insect'? Give a list of such insects, and state in what way each of them is beneficial.

(2) Why is it that, although soil is seen to be washed away by rain, its thickness usually remains fairly constant, and even increases in some places?

(3) How do non-leguminous crops, used as green dressings, benefit the soil?

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Thursday, July 28, by the SS. 'Sobo', from an official visit to the Leeward Islands.

FUNGUS NOTES.

RECENT WORK ON DISEASES OF COCOA-NUT PALMS.

The information contained in the following article is taken from *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon*, Vol. IV, Nos. 22 and 24, on 'The Stem Bleeding Disease of the Cocoa-nut' and 'The Root Disease of the Cocoa-nut Palm', by Petch, and from two articles in the *Bulletin of the Department of Agriculture, Trinidad*, Vol. IX, No. 64, the first entitled 'The Bud Rot of the Cocoa-nut Palm', by Rorer, the second 'Cocoa-nut Palm Diseases', by Mr. J. B. Johnson, Assistant Pathologist to the United States Department of Agriculture. The diseases described in these papers are three in number, namely, the bud rot disease, the root disease, and the stem bleeding disease.

BUD ROT DISEASE. According to Rorer and Johnson it is now almost certain that this well-known disease of cocoa-nut palms is due to the action of bacteria. The causative organism has not yet been definitely separated, but evidence accumulated from various parts of the world leaves very little doubt as to its nature. The disease, as is well known, occurs in several islands of the West Indies, and one with very similar characters has been found in various parts of the East, particularly in India, Ceylon and the Philippines.

In Trinidad bud rot is usually distinguished 'by the yellowing and drooping of the leaves, the falling of the immature nuts, the wilting and breaking over and browning of the terminal leaf and the putrid condition of the whole of the region of the cabbage'. Apparently the disease may commence either in the young central tissues or at the base of the outer leaves. In the latter case its action is not so rapid as it is in the former. In Ceylon it would seem that the disease always commences in the cabbage, and the young erect leaves become brown and dead, while the outer whorl of leaves is still apparently healthy. The fact that the disease commences at the centre and not at the outside is one of the characters by which it can be separated from the root disease as found in the latter island.

Various methods of dealing with this disease have been suggested, and it is possible that in very early stages flaming or, in the case of young plants, the use of Bordeaux mixture may be found effective in checking it, but in advanced cases little can be done in the way of remedial measures, and the safest course to pursue is to promptly and thoroughly destroy all trees showing advanced symptoms of the disease. In Trinidad, the Board of Agriculture voted the sum of $500 for the purpose of destroying diseased trees, and the work was started on November 30, 1909, under the direct supervision of an agricultural inspector.

ROOT DISEASE. A root disease of cocoa-nut palms is reported from both Trinidad and Ceylon, but the accounts given from the two islands would appear to indicate that they are not due to the same organism. The Trinidad disease was described by Stockdale in 1906, and attributed to a species of Botryodiplodia. A similar disease of cocoa-nut palms at Travancore in India is described by Dr. E. J. Butler and also attributed by him to a species of Botryodiplodia. The symptoms of root disease in Trinidad, as described by Stockdale, are somewhat similar to that of the bud rot. It may be recognized by a yellowing and hanging down of the leaves, by the disorganized condition of the cortex of the roots, by the formation of a red ring of discolouration in the stem, and by the eventual death and rotting of the cabbage. The diseased roots generally contain the mycelium of the fungus called *Botryodiplodia* sp. As a result of a critical examination of the literature, Johnson is of the opinion that Stockdale's conclusions were not warranted, and states that, according to his own observations, the disease of the roots is of bacterial origin and in all probability due to the same organism as that causing the bud rot disease, so that in reality the bud rot and the root diseases of cocoa-nut palms in Trinidad are identical in origin. Johnson appears also to be of the opinion that the various forms of bud rot met with in different parts of the world are identical, and due to the same organism as is found in Trinidad. Since this is the case, it is evident that the root disease found in Ceylon cannot be considered as identical with that in Trinidad, for Petch proves almost conclusively that the disease is due to a fungus, *Fomes lucidus*, which belongs to the family of bracket fungi. The symptoms characterizing the disease in Ceylon are as follows: '(1) The outer leaves wither and droop, usually remaining for a long time suspended vertically around the stem; (2) the tree becomes barren owing to the suppression of the flowering branches; (3) new leaves are successively smaller, so that the crown becomes a handful of dark yellowish leaves; (4) finally these small leaves wither and the bud decays.' Instances were noted in which the tree was killed so rapidly that the leaves and terminal bud dried up before the decaying of the latter had time to commence. The fungus causing the disease develops in the outer ring of vascular bundles in the butt of the tree, that is from the ground level to a distance of about 3 feet above the ground. The water-conducting cells become filled with hyphae, and in this way the food supply from the roots is cut off. The mycelium of the fungus is, in general, white but the older hyphae are often brownish in colour. Another fungus, *Lasiodiplodia theobromae*, which is better known in connexion with the diseases of cacao, was frequently found to occur in the dead roots of cocoa-nut palms, but careful investigation showed that it was almost certainly saprophytic in this case. It may be stated here that the fungus referred to by Stockdale as *Botryodiplodia* sp., and found on dead roots of cocoa-nut palms in Trinidad, is now known to have been also, in all probability, *Lasiodiplodia theobromae*. In addition to attacking cocoa-nut palms, *Fomes lucidus* can affect bamboos, mango and flamboyant (*Poinciana regia*). As noted above, Petch calls attention to the difference between the symptoms typical of the root disease as found in Ceylon, and those characteristic of bud rot disease. It may also be noted that the root disease in Ceylon differs from that in Trinidad in the absence of the red discolouration of the stem, and in the fact that the terminal bud is frequently quite healthy.

In the case of monocotyledonous plants such as the cocoa-nut palm, there is not much possibility of treating root diseases, but the following preventive measures are recommended: all diseased trees should be felled, and the butt, with the last 2 or 3 feet of the stem, burnt. It is not necessary to burn the upper portions of the tree as these are not infected by the fungus. When the tree has been felled, a trench at least 2 feet deep should be dug around the roots, which may then be left in the soil to decay. There is very little likelihood that these roots will serve as a source of infection, since the food supply which they contain is rapidly consumed both by the fungus causing the disease, and by numerous other saprophytic fungi, such as *Lasiodiplodia theobromae*, which has already been alluded to; when the food supply is exhausted these fungi will necessarily die of starvation. Lastly, it is advised that the hole from which the tree has been removed be left open for at least one year.

STEM BLEEDING DISEASE. The symptoms of this disease

vary somewhat according to the age and nature of the trees. In general, cracks appear in the bark from which oozes a brown viscid liquid that soon turns black and leaves a dark stain around the hole. On cutting away the cortex near the hole, it is often found that the tissue has become soft and watery through decay. In some cases the outer layer of tissue falls off, leaving a hole filled with fibres. Frequently, such are cleaned out by termites, and a white, smooth hollow is thus made, extending to the so-called wood. In other cases, spiral cylindrical hollows are formed, running up and down the inner tissues of the stem, and in extreme cases the whole tree may be rendered hollow from the base to within 2 or 3 feet of the terminal bud. This may happen even when but few bleeding patches are visible on the outside. Trees so attacked are not necessarily killed, and the effect of the disease on the crop is so small as to be entirely masked by the much greater influence of differences in the rainfall from year to year. The limitation of the disease to the stem of the trees may possibly be due to the fact that this is the only portion which contains a sufficiently large percentage of sugar to enable the causative fungus to thrive. This fungus is *Thielaviopsis ethaceticus*, which is also responsible for a disease of pine-apples and of sugar-canes in various parts of the tropics. Petch found that it was unable to live on dried leaves or dried husks of the cocoa-nut: consequently its spread is not effected by such débris. He is also of the opinion that there is no danger of increasing the prevalence of this disease by the manufacture of coir. Though this fungus does not appear to damage the trees materially, yet injured trees are frequently broken by high winds, and in this way loss is caused. As a consequence, the following remedial measures are recommended: the diseased parts should be cut out completely, and all chips burnt. This operation is best performed with a chisel and mallet. Slanting wounds should be made, so that water may drain away. When the diseased material has been removed, the surface of the tissues should be carefully burned with a torch, to dry it, and a coating of tar applied to the wound. In conclusion, it may be worthy of mention that lightning, fire and root disease may cause bleeding patches on the stems of cocoa-nut palms, but these patches may be distinguished from those caused by *Thielaviopsis ethaceticus* by the facts that they are usually more numerous, and that the sap which exudes is of a much lighter red-brown colour, less viscid in nature, and causes a rusty discolouration.

Earlier references to this subject will be found in the *Agricultural News*, Vols. IV, pp. 121, 299 and 369; VI, pp. 75 and 250; and VII, p. 219; and in the *West Indian Bulletin*, Vols. VI, p. 307; IX, p. 361.

ECONOMIC PLANT STUDY IN BRAZIL.

By a recent reorganization of the Brazilian National Museum, special attention will be given to the study of fibre plants, insects harmful or beneficial to agriculture, plant diseases caused by vegetable parasites, etc. The results should be far-reaching, as many vegetable products growing in profusion in the country, especially fibre plants, have no commercial value because of lack of knowledge as to their adaptability to industrial uses.

The Government has resolved that the directors of the famous botanical gardens of Rio de Janeiro shall assume some functions delegated to them by the Ministry of Agriculture in the nature of experimental station work. A department is to be maintained for the study of plants and trees for commercial purposes.

In the growing of fruits, to which special attention is to be devoted, experiments in producing new varieties of native fruits will be undertaken for the purpose of obtaining hardier products, which will be suitable for export and transportation to distant countries. Those in charge of the experimental station will receive boys of from twelve to twenty years of age as apprentices, to whom a small stipend may be paid. Apprentices giving satisfactory service and evidence of special adaptability to the work will be given opportunity for advancement, and will be recommended to agriculturists who wish to employ experienced horticulturists on their own account.

A thorough study of fruits commonly raised in Brazil, carried on along scientific lines, would doubtless mean much to the fruit industry of the country. Most fruits grown here now are either not cultivated at all, or if real cultivation is resorted to, in either case the fruit is much the same as that growing in a wild state.

Grapes are cultivated in various States on a larger scale than is any other fruit, but the methods used and the means of transportation are so costly that the home-grown grape is scarcely able to compete with Spanish and Portuguese fruit of a similar quality. Oranges, with the same care given to the fruit in California, could be grown here at a much lower price than in the United States, and if properly packed and refrigerated, could be shipped in large quantities to the United States and to Europe. The insistent attention which the Brazilian Government is giving to these matters must certainly result in a great improvement in conditions as they now exist in fruit-growing. (*Monthly Consular and Trade Reports*, June 1910.)

AGRICULTURE IN ELEMENTARY SCHOOLS, BARBADOS.

The following information concerning the state of agricultural instruction in elementary schools in Barbados, is taken from the *Report of the Elementary Schools*, 1909, of that colony:—

The interest taken by the children in school garden cultivation has not declined, although if the number of exhibits sent to the Agricultural Department should be taken as the criterion, it would appear so. It is true that the number of competing schools, and of the exhibits at the Show held at Lancaster in December of this year were fewer than the number at the Mount Exhibition in 1908, and the number sent on some other occasions. But as it has been stated before, the centre at which the exhibition is held has very much to do with the number of both the juvenile and the adult peasant exhibits. There are schools in every district of the island, but there is not land for school gardens at many of the schools; and again, all teachers have not the knowledge required for directing such work. While the exhibition is always open to the children of the whole island, it is not possible for the children of distant schools to attend the show that is many miles off, far less to carry or send the produce.

It is encouraging, however, to observe, that on each occasion some addition is made from the district in which the exhibition is held to the number of schools which undertake this subject. The large Boys' School at St. Silas this year for the first time showed garden-work, and the quality of the exhibits from that school was good; it stood second on the list of schools for a diploma.

Southborough again took the first place. Greenwich, although an Infant School, also sent several creditable exhibits which won prizes. At the General Exhibition of the Agricultural Society, the beets and carrots which won the highest prizes were the products of school gardens.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 19, 1910; Messrs. E. A. DE PASS & Co., July 8, 1910.

ARROWROOT—St. Vincent, 1⅞*d.* to 2 1/16*d.*
BALATA—Sheet, 4/1; block, 3/2 per lb.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 48/- to 53/-; Jamaica, 46/6 to 51/6.
COFFEE—Jamaica, 36/6 to 52/-.
COPRA—West Indian, £26 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 52/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 60/- to 70/-.
HONEY—25/- to 31/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/2; concentrated, £18 10*s.*; Otto of limes (hand pressed), 5/9 to 6/-, nominal.
LOGWOOD—No quotations.
MACE—1/6 to 2/-.
NUTMEGS—Quiet.
PIMENTO—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
RUBBER—Para, fine hard, 10/-, fine soft, 9/2; fine Peru, 9/9 per lb.
RUM—Jamaica, 1/11 to 5/-.
SUGAR—Crystals, 17/9 to 19/9; Muscovado, 13/6 to 15/-; Syrup, no quotations; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co, July 8, 1910.

CACAO—Caracas, 11c. to 11¼c.; Grenada, 11c. to 11⅛c.; Trinidad, 10¾c. to 11¼c.; Jamaica, 9c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, \$27·00 to \$28·00; culls, \$16·00 to \$17·00; Trinidad, select, \$27·00 to \$28·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, ordinary, 8½c. to 8¾c.; good ordinary, 9c.; and washed, up to 10¾c. per lb.
GINGER—9½c. to 12½c. per lb.
GOAT SKINS—Jamaica, 55c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—\$2·75 to \$4·00 per box.
LIMES—\$4·20 to \$6·50.
MACE—30c. to 36c. per lb.
NUTMEGS—110's, 8¾c. to 9c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 4·33c. per lb.; Muscovados, 89°, 3·83c.; Molasses, 89°, 3·58c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., July 23, 1910.

CACAO—Venezuelan, \$11·00 to \$11·25 per fanega; Trinidad, \$10·65 to to \$11·00.
COCOA-NUT OIL—\$1·11 per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$4·25 to \$4·30.
ONIONS—\$1·50 to \$2·00 per 100 lb.
PEAS, SPLIT—\$6·00 to \$6·20 per bag.
POTATOS—English, \$1·00 to \$1·10 per 100 lb.
RICE—Yellow, \$4·35 to \$4·40; White, \$5·00 to \$5·10 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., July 30, 1910; Messrs. T. S. GARRAWAY & Co., August 2, 1910; Messrs. JAMES A. LYNCH & Co., July 25, 1910.

ARROWROOT—St. Vincent, \$3·30 to \$3·75 per 100 lb.
CACAO—\$10·75 to \$11·50 per 100 lb.
COCOA-NUTS—\$18·00.
COFFEE—Jamaica and ordinary Rio, \$10·00 to \$11·00 per 100 lb., scarce.
HAY—\$1·20 to \$1·40 per 100 lb., dull.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·25 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·25 per bag of 210 lb.; Canada, \$3·45 to \$3·50 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·25 to \$2·60 per 160 lb.
RICE—Ballam, \$5·35 (180 lb.); Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, July 23, 1910; Messrs. SANDBACH, PARKER & Co, July 22, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·00 per 200 lb.	\$8·00 per 200 lb., market dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	\$1·08	No quotation
CASSAVA STARCH—	\$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	\$3·75 to \$3·80 per bag of 168 lb.	\$3·80 per bag of 168 lb.
Green Dhal	\$5·00	——
EDDOS—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		——
Madeira	2¼c. to 2½c.	2¼c. to 2½c.
PEAS—Split	\$5·75 to \$5·80 per bag (210 lb.)	\$5·75 per bag (210 lb.)
Marseilles		No quotation
PLANTAINS—	20c. to 40c. per bunch	——
POTATOS—Nova Scotia	\$3·00	\$3·00
Lisbon	\$1·30 per 70 lb.	No quotation
POTATOS—Sweet, Barbados	\$1·80 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·50	\$5·00 to \$5·50
TANNIAS—	\$3·00 per bag	——
YAMS—White	\$2·40	——
Buck	\$3·12	——
SUGAR—Dark crystals	\$3·00 to \$3·05	None
Yellow	\$3·60 to \$3·70	\$3·70
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·25 to \$2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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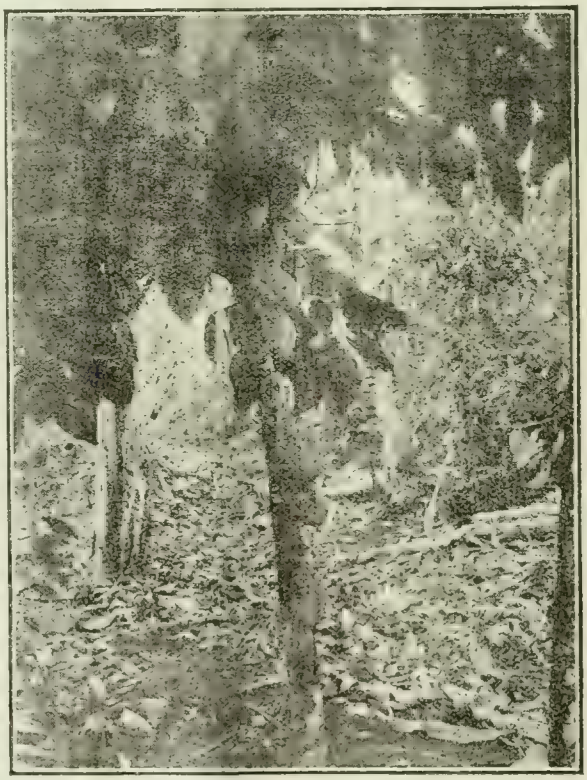

AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW
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CONTENTS.

The Essentials for the Growth of Plants.

THERE is always before the mind of the practical agriculturist, and of the agricultural investigator, the consideration of the surroundings of the plant, in relation to their effect on its life, and to the limitation by them of the possibility of its existence. If plants, in a given instance, are thriving, how can they be protected from adverse influences, and more, be made to increase the yield of their produce? If, again, certain plants show lack of vigour, or do not produce reasonably good crops, what must be done in order to restore them to health and a proper state of activity, or vitality? It is evident that, given a well established, useful plant, a partial answer to these questions can be obtained by reference to its surroundings; and it may be that a reasonable consideration of these will supply a clue as to future procedure for the benefit of the plant.

Careful advertence to the surroundings of the plant is always justified, but there is a danger that it will not be achieved with thoroughness, because the continual recognition of its necessity is likely to bring about the loss of the mental view of the plant itself, on account of the intentness of the gaze upon its environment. This is partly due to the fact that the ordinary needs of plants are well known. They are not, however, sufficiently present to the mind, in particular instances, to make it unnecessary to recapitulate them, in the light of the special conditions. Thought given to the plant, in relation to all its possible requirements, will often prevent the waste of time and money on useless measures for its improvement, and will generally make it evident as to what is the best course to adopt in the definite event.

The importance of obtaining a thorough view of the ideal surroundings of a plant, in the light of its needs, will be more readily realized after the following principles have been considered. The growth of a plant does not rely upon several independent circumstances, any one or more of which may be absent, provided that the others are present in abundance; there are, on the contrary, several conditions that must be satisfied, and the omission or insufficiency of any

one of them will prevent its proper development from taking place. These conditions are called limiting factors, because each of them alone is always, and absolutely, necessary to the growth of the plant. Further, as is stated in a recent article * that deals with the subject, and which may be consulted with advantage, the factors requisite for the life of a plant mostly act together throughout its whole existence; they do not show their influence successively. The result is that the partial absence of any one of these factors, at any time, only allows the others to exert their influence to an amount that is permitted by the degree to which it is present; while its total absence completely prevents them from being useful in any way.

It will be well, now, to consider the nature of these essentials that must be satisfied simultaneously, and each in its proper degree, before the growth of green plants can continue. They are, in order of immediate urgency: (1) the presence of water; (2) a certain range of temperature; (3) a supply of mineral salts; (4) the presence of certain kinds of light; (5) air containing oxygen and carbon dioxide. These will be taken in order.

The necessity of water to plants is that which is most readily recognized, and the want of this essential is most quickly shown by them. If it is considered alone that man is dependent upon the rainfall for this requisite, it is easy to regard him as being helpless in its absence or insufficiency, owing to the failure of the latter. That this view of the matter is not justified is made evident from a review of the progress that has taken place in matters of irrigation, and what is more important, in that of the treatment of the soil for the purpose of conserving the amount of moisture that it contains already. The knowledge that has been gained concerning surface tillage has opened up, for the agriculturist, parts of the world that were formerly considered of too arid a nature ever to be of any use to him; and it has given him, in places subject to intermittent droughts, a means of saving the water in the soil, for the uses of his crop, so that he is assured of some return for his toil, even in circumstances under which he would have previously despaired. The importance of the supply of water to plants will be realized all the more clearly in the apprehension that its insufficiency or absence lessens or destroys the usefulness of all the other factors. However rich the soil may be, the plants in it can only make use of as much of the food that it contains as is permitted by the proportion to which their needs for water are satisfied. Artificial manures, in the absence of sufficient water, are wasted in a large degree, for the immediate crop. They are, indeed, directly harmful, in any quantity, for they make it less easy for the plant to absorb what water is present, by stunting the growth of the roots, and by increasing the strength of the soil water solution, so that the efficiency of the root hairs in taking it up is seriously impaired.

Most green plants show distinct preferences in the matter of temperature; this is the most powerful factor in regulating the arrangement of the different kinds over the surface of the earth. In temperate climates, the distribution of heat or cold throughout the year is of the greatest importance to the agriculturist. In the tropics, it only requires consideration in relation to the possibility of the introduction and acclimatization of plants; it is always sufficiently high for the needs of those which are indigenous.

The quantity of mineral salts that is necessary to plants is very small; where these are present abundantly, however, the plant will make use of much more than the requisite minimum, with a probable increase in its development. The concern of the practical agriculturist is, naturally, most particularly connected with the knowledge of means to supply the essential amounts of this kind of plant food. It is a matter of interest that some mineral constituents, if they are deficient, can be replaced to some extent by others; examples of this substitution are magnesium for calcium, and silica (in cereals) for phosphoric acid; it is assisted to be of use to the plant, by the power of selection that the latter possesses—a power which enables it to make the best of what is at its disposal. Short mention, only, is required of the fact, that the agriculturist can come to the assistance of the plant with arrangements for fallowing, rotation and the employment of artificial manures.

It is a matter of common knowledge that green plants require light, though they do not succumb, for some time, on being deprived of it. The necessity for light is bound up with that for air, and the two can be best considered together. A plant deprived of air would most quickly suffer for want of oxygen, which is necessary to it, and which it can use whether light is present or not. The case is different in regard to carbon dioxide, for this can only be used with the aid of light. Under ordinary conditions, the former requisite is always present, but it is of no use to the plant unless the right kinds of light are available to assist in its assimilation. Practical considerations rarely require to take account of these essentials, but they are

* The *Journal of the Department of Agriculture of Victoria*, Vol. VIII, p. 353.

interesting because, like manures and water, they supply examples of limiting factors that are mutually interdependent.

The contemplation of these facts, like that of many others connected with agriculture, serves, for one thing, to bring forward the importance of proper tillage. Without water, food in the soil cannot be used; without proper conditions in the soil, food cannot be produced and liberated there; without the presence of this food, the plant cannot make use of the light and air by which it is surrounded. Proper tillage provides for the regulation of the first two of these, so that the third condition, which is always fulfilled, may be employed by the plant to the best advantage.

It will be evident, now, that the minimum extent of the presence of any one of the essentials of plant life causes a minimum employment of the others. This explains why, often, the supplying of a single factor, to its proper extent, will cause a large and significant increase in the crop yielded by a plant, and why, for the determination of this factor, the most successful results will be obtained by a thorough and methodical consideration of its requirements.

SUGAR INDUSTRY.

PRODUCTS FROM CHANGES IN THE GLUCOSE IN MOLASSES.

The most recent numbers of the *International Sugar Journal* have contained articles, by H.C. Prinsen Geerligs, on the products that are formed in molasses as a result of the decomposition of glucose. The conclusions that are reached at the end of the investigation are given in the July number of that journal, and are reproduced here.

The results of the experiments detailed seem to be that, under circumstances that normally occur in cane-sugar factories, part of the invert sugar of the juice is broken up into bodies which partly escape in a gaseous state, and partly remain in the juices, syrups and molasses. The latter are but slightly optically active, are liable to further continuous decomposition, have a dark-brown colour, and possess an unstable reducing power, which is at any rate much less than that of a similar weight of invert sugar. It is not yet ascertained whether any of these decomposition products are fermentable, but it is certain that at least a part of them may be encountered in the residuum left behind after complete fermentation.

The decomposition products are non-volatile, totally combustible bodies, and therefore are not found when determining the water and ash content. Further, they have a slight rotatory power, which exerts a small influence on the sucrose determination by direct polarization, and none at all on that determination by double polarization by Clerget, so that they are not included with the sucrose. Their reducing power is less than that of an equal weight of invert sugar, and as the amount of that constituent is exclusively ascertained in our analyses by the weight of cuprous oxide precipitated from Fehling's solution, it is clear that, although the percentage of glucose will be found a little too high, yet the great bulk of the decomposition products escape detection and determination. They are also soluble in acid alcohol, and are, accordingly, not found together with the real gummy matter; further, they are only partly precipitated by basic lead acetate, and do not show to the full extent in the figure for the gums ascertained after Peck's method.

It is thus seen that the decomposition products are not determined by the usual methods used in the analysis of molasses, and that these products may be held accountable for the discrepancy always met with on comparing the sum of constituents determined individually with the total dry substance found by dessication.

Our experiments in separating exhausted molasses into fractions by means of precipitation with alcohol showed that the unknown organic body behaves just as the sugars. It collects in the same fractions as sugars do, which leads us to believe that it plays the same part in the formation of molasses as does the glucose from which it originates.

At any rate, its amount is in some cases so very great that it even exceeds that of the unchanged glucose, and when in those molasses a low purity is accompanied by a very low glucose content, we are convinced that this is because the decomposition products of the glucose have taken its place in the formation of molasses, and that the sum of glucose, and decomposition products of glucose which have the same melassigenic power, accounts for the small amount of sucrose which is combined in an uncrystallizable form in the cane sugar molasses.

A Central Sugar Factory for Zululand.—The following report is taken from the *Produce Markets' Review* for July 2, 1910, which reproduces it from a recent number of the *Board of Trade Journal:*—

The Imperial Trade Correspondent of Durban reports that, in connexion with the alienation of Crown Lands in Zululand, for the purpose of growing sugar (see *Board of Trade Journal* of September 3, 1908, p. 489, and previous notices), the Natal Government is prepared to receive proposals from persons or companies desirous of erecting and working a central sugar factory at Umfolozi. There are approximately 12,000 acres of land at Umfolozi, to be subdivided into farms varying from 300 to 400 acres in extent, and the contracts of allotment will require that from 7½ to 15 per cent. of the area of each farm shall be planted with sugar-cane during the first three years, and that not less than that area shall be maintained under similar cultivation for a period of ninety-nine years.

The machinery of the factory must be capable of dealing with not less than 10,000 tons of sugar in each season. The scheme may provide for main tramway lines to sugar lands or to the Natal Government railways, and for branch tramways, upon terms to planters.

The details of the scheme are left to proposers, but it is suggested that terms for expropriation should be included.

Proposals will be received by the Under Secretary for Agriculture, Pietermaritzburg, up to July 31.

FRUITS AND FRUIT TREES.

THE ACID CONTENT OF LIME FRUITS.

A report has been received, through the Curator of the Dominica Botanic Station, of investigations that have been made by Mr. G. A. Jones, the Assistant Curator of that Station for the purpose of ascertaining the circumstances upon which the acid content of lime fruits depends.

According to this, it appeared, when the investigations were commenced, that variation in acid content might be due to at least six different causes, acting singly, or, in different degrees, together. These causes are given as: –

(1) Variation due to individual differences in the characters of trees growing under identical conditions.

(2) Variation due to the variety of lime grown; that is to say, whether spiny or spineless.

(3) Variation due to rainfall.

(4) ,, ,, ,, difference in size of fruits

(5) ,, ,, ,, ,, ,, soil.

(6) ,, ,, ,, methods of cultivation and manuring.

So far, only the first four of these have been taken into consideration, and that independently of one another. In the experiments, equal volumes of lime juice were extracted, for making the observations, from the same number of limes In the following account, the different phases of the investigation will be taken in the order given above.

(1) In connexion with variation due to individual differences in the characters of trees growing under identical conditions, limes were taken from the twenty-eight trees in the spineless lime plot at the station, and the acid content of the lime juice from each tree was determined. The tests showed that there was a distinct variation in this among the different trees, the lowest being 13·7oz. of citric acid to the gallon (39·7 gr. per oz.), while the highest was 16·2 oz. to the gallon (43·2 gr. per oz.); this is is a difference of 2·5 oz of citric acid to the gallon (3·5 gr. per oz.) between the richest and poorest juices. It is suggested that these results may form the basis of attempts to improve the lime, in the matter of its acid content, by means of chemical selection.

(2) The difference due to the variety of lime grown is considered from the point of view of analyses made by Dr. Francis Watts, in Antigua, and recorded in the Annual Reports on the Dominica Botanic Station, etc., for 1905-6 and 1906-7. These showed that the juice from the spineless variety has a distinctly higher acid content than that from the ordinary one, but that this higher acidity only appeared in the case of those grown at the Dominica Botanic Station; there was little difference in favour of spineless limes grown in the country. It is pointed out that this circumstance suggests that the increased acidity of the juice from the spineless limes is not a fixed character, but is affected by certain definite conditions.

(3) Reference is made to the common opinion that limes grown in regions of higher rainfall have the weaker juice. In order to gain definite information in this matter, fruit was obtained from planters in different districts of the island, together with information in each case as to the rainfall during the preceding five months; that is to say, during the time that the limes were arriving at maturity. Tests of the juice give the following results:

Rainfall, inches.	Citric acid, oz. per gal.	Citric acid, gr. per oz.	Citric acid, oz. per gal. (Average.)
16 to 27	14·1 to 14·8	38·6 to 40·6	14·6
29 ,, 39	13·1 ,, 13·8	35·9 ,, 37 7	13·5
42 ,, 72	12·4 ,, 12·8	33·8 ,, 35·0	12·6

These figures indicate that acidity decreases with rainfall, and they would probably have been more striking if the season had not been abnormally wet.

(4) The variation in acid content due to the size of the individual fruits is closely connected with that due to rainfall, because an increase in the latter means the production of the larger fruits. The limes for this part of the investigation were received from the estate on which the rainfall was 24·4 inches for the period of five months. The smaller limes yielded a juice containing 14·8 oz. of citric acid to the gallon (40·6 gr. to the oz.); that from the large fruits contained 30·7 oz. to the gallon (37·4 gr. to the oz.). Although the difference is considerably in favour of the smaller fruits, in considering this result in relation to the yield of citric acid from an estate, allowance must be made for the effect of the heavier rainfall in producing more vigorous trees with a larger yield of fruits.

A summary given at the end of the report shows: (1) that lime trees grown under the same conditions exhibit individual variation in the acid content of the juice; (2) the higher acidity of juice from the spineless variety is not a constant character; (3) the acid content of lime juice is affected intimately by the rainfall; (4) the juice from large limes is weaker than that from small ones.

METHODS OF PLANTING TREES.

Information in regard to experiments which have been conducted at the Woburn Fruit Farm of the Duke of Bedford for the purpose of ascertaining the effect of planting trees by various methods was given in the *Agricultural News*, Vol. VIII, p. 101. Since this, similar experiments have been commenced at the Botanic Stations in Antigua, Dominica, Montserrat, St. Kitts and St. Vincent, and trials are being started at the present time in St. Lucia. An account of these, as far as they have been conducted, will appear in the next volume of the *West Indian Bulletin* (Vol. XI, No. 1). In view of their interest, the following additional information is given, most of which is taken from the *Ninth Report of the Woburn Experimental Fruit Farm*, in which the investigations are described.

In the first few series of experiments at Woburn, the roots of the trees were forced into holes too small for them, without being trimmed or spread out; the earth was then thrown into the hole and stamped down violently. As is pointed out, the chief effect of this violent stamping is to injure the condition of the soil; the other effect of the unorthodox planting is injury to the roots. In all the later trials, these two factors have been kept separate.

The way in which the trees were planted, with ramming, is described in the report in the following words: A few forkfuls of earth were removed, so as to make a shallow hole; into this the tree was put, with the roots just as they happened to come; the earth was shovelled over them, and rammed with a heavy rammer till the whole was thoroughly puddled, and shook like a jelly at each stroke. As one of our critics said, it is planting trees gate-post fashion, and we cannot improve on his graphic description of the process; certainly any workman who had been found planting a tree in that way a few years ago, would have been promptly dismissed, and the tree would have been considered as doomed.

The planting was done at various times while the trees were in the dormant state, and with various conditions of soils. The trials were carried out at seventeen stations; this afforded the opportunity for making them in soils of very different kinds.

As regards the effect of ramming on the length of new wood formed, it was found that the number of cases where this produced good results was from four to six-and-a-half times greater than where its influence appeared to do harm.

Observations on the effect on the stoutness of new wood formed showed that, of thirty-five pairs of trees that were examined, there were only four cases where the unrammed plant made stouter growth than the rammed tree near it.

The effect of ramming on the root formation was that the roots showed nearly the same excess of growth as the branches, and photographs are given which show unmistakably the much greater branching of the roots that has taken place in the rammed trees.

In relation to the effect on the total growth, that is the increase in weight of the whole tree, plants lifted at the end of three years showed an average of 114 per cent. in favour of the rammed trees. Later experiments with bush fruits have confirmed this, except apparently in the case of raspberries; and even with these, a superiority was shown by the rammed plants when the suckers from the roots were not taken into consideration. It is easy to understand that the hardened condition of the soil interfered with the throwing up of these suckers.

No definite information is available as yet, as to the effect on the crops of fruit produced by the trees, for none of them have been allowed to form fruit during the first and second seasons, in order that there may be no interference, through this cause, with the growth. Indications have been obtained, however, that the period of fruit-bearing arrives earlier in the case of rammed trees, and that there is a possibility that these will bear heavier crops. Experiments with bush fruits showed, at any rate, that no loss of fruit need be feared, as a consequence of ramming, even during the first few years of fruit-bearing.

The explanation of the better results that are obtained by ramming, when planting, is stated to be that the more intimate contact of the soil with the roots, resulting from the process, favours the growth of a larger number of new rootlets. As regards the effect of ramming on the water content of the soil, it is thought probable that the alteration in the amount of this has little influence on the results obtained.

In all experiments of the kind that are conducted, it is important that allowance should be made for the circumstance that increased development cannot be expected to show itself immediately, because this naturally arises as a result of increased root formation consequent on ramming, and time must be given for these roots to grow and exert their functions. It is in this way that a preliminary period of decreased growth has been noticed: and this appears to have a further effect, even for a few further seasons, in retarding the springing into growth after the dormant season, by a few days.

A matter of some interest, in relation to the Woburn Experiments, is contained in the *Gardeners' Chronicle* for July 2, 1910, where a description is given of a visit by a party, consisting of members of the Council and the Scientific and Fruit Committee of the Royal Horticultural Society, to the Experimental Fruit Farm at Ridgmont, where some of the trials have been undertaken. This contains the following passage: So convinced are the experimenters at Woburn of the lack of necessity for the care usually taken in planting, and of the good results of ramming, that they will not tolerate upon the place a cultivator who plants in the ordinary way.

THE BUDDING OF THE EGG PLANT.

The following note, prepared by Mr. A. J. Brookes, Officer-in-charge of the Dominica Agricultural School, has been received through the Curator of the Dominica Botanic Station :—

One of the best cultivated varieties of the egg plant (*Solanum Melongena*) is that known as 'Henderson's New York Spineless'. This plant, when grown on its own roots, will bear an average of eight to ten marketable fruits.

An allied form, *Solanum torvum*, is to be found growing wild in most of the West Indian Islands. This common weed forms an excellent stock upon which the more delicate variety above mentioned may be grown. If this stock is budded in the same way as for the orange, the buds will be found to take more readily than in the case of tongue or cleft grafting. Plants of the New York Spineless variety, when treated in this way, bear from twenty to thirty marketable fruits in a season.

The fruits obtained by the pupils of the Dominica Agricultural School, by carrying out this method of propagation, sell readily at 2*d.* each in the local market.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 28, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 150 bags of West Indian Sea Island cotton have been sold, at rather easier prices. They are chiefly comprised of small lots from various islands, and the prices realized range from 19*d.* to 21*d.*

Spinners are not inclined to buy until more is known of the condition of the growing crop in America, and the remainder of the stock here is rather unsaleable at the moment, in consequence.

COTTON-GROWING IN CEYLON.

The following information concerning the state of cotton cultivation in Ceylon is taken from the Report of the Ceylon Agricultural Society, 1909-10:—

The prospects of cotton cultivation may be said to have somewhat improved. Trials in different parts of the island —Chilaw, Hambantota, Madugoda, etc.—tend to show that Sea Island cotton, if grown at the right season and cultivated in the proper way, can be successfully raised, and produces a lint which is infinitely superior to that of any local variety. Professor Dunston, who, while in Ceylon last March, evinced great interest in the possibilities of cotton cultivation, was inclined to think that an improved Upland variety, such as 'Black Rattler', should suit local conditions better than any other. Acting on this advice, the Society has, with the help of the British Cotton-Growing Association, secured a consignment of this seed.

The occurrence of areas that refuse to grow any of the crops successfully raised in other parts of the island, the opening up of large acreages in cocoa-nuts in the dry districts, the depression in the tobacco trade as a result of the enhanced duty on tobacco imported into India, the existence (though to a limited extent) of a spinning and weaving industry, the probability of a reliable local agency being shortly established to act as a medium between the grower and the market, and lastly, the possibility of successfully growing cotton in suitable areas, are all circumstances which favour this cultivation.

The laudable efforts of the British Cotton-Growing Association to encourage cultivators have, so far, not been attended with the success they deserved. Had an old established and well-known firm been chosen as the local agents of the Association in the first instance, considerable progress ought by now to have been made. The temporary suspension of ginning operations, and the want of an agency to handle the produce, have acted as a serious set-back, while the extraordinary prosperity of the other agricultural industries of the island has tended to push any new crop out of consideration.

AGRICULTURE IN THE ST. VINCENT SOUTHERN GRENADINES AND CARRIACOU.

The agricultural conditions in the St. Vincent Southern Grenadines, namely Canouan, Mayreau and Union Island, and in Carriacou are described in a report which has been made recently by Mr. W. N. Sands, Agricultural Superintendent of St. Vincent, and this has been made use of in supplying the following information. In describing these conditions, the islands will be taken in the order mentioned.

CANOUAN. This island is situated about 25 miles south of St. Vincent, and is believed to have an area of about 1,700 acres. The soil is fairly fertile and easily worked, and in seasons of average rainfall a reasonable yield can be obtained from it. If there is sufficient rain, planting begins in May; but it is sometimes necessary to postpone it until July or August.

The chief crops grown are cotton, Indian corn and pigeon peas; there is a small stock-raising industry and a whaling station. For sowing purposes the land is simply scraped over and holes are chopped in it with a hoe. Manure is not used, and as cotton is grown as a perennial, often for many years at a stretch, new seed is only required for supplies or for planting new land. The cotton is grown at 4-foot distances, in the row and between the rows. Corn forms intermediate rows, and peas are planted in about every sixth and around the boundaries of the field. There is great neglect in the matter of thinning the plants, in most cases, and weeding is only done when it is thought to be necessary. After the harvest, for the succeeding crop, the old cotton plants are cut back to form stalks about 1 foot high. The only method employed for assisting in the restoration of the fertility of the land is to allow it to remain as pasture-fallow. This description of the system of cultivation applies to all the other islands mentioned.

The type of cotton grown is, as is well known, the Marie Galante. The plant producing it is a hardy perennial and gives a coarse lint of quality between that of Upland and of Egyptian, the percentage of lint to seed-cotton being twenty-four, and the seed produced being perfectly clean and black. The output last season, from 218 acres, was 10,660 ℔. of lint —a yield of 48 ℔. per acre. Another type of plant which gives a product called 'silk' cotton is occasionally grown, but not to any extent.

Most of the cotton is produced on the metayer system. During the past season it was sold to the Government

Central Cotton Ginnery in St. Vincent, for the first time, and the results appeared to be encouraging to the owners.

The chief pests that were observed to attack cotton were leaf-blister mite and the snow scale. Though these are said to do little damage, it is evident that their presence must result in a lowering of the yield, especially in dry years.

MAYREAU. This has an area of about 600 acres, and the soil and crop conditions are not unlike those of Canouan, although the former appears to be poorer than that in the last-mentioned island.

In the last crop of cotton, 5,416 lb. of lint was obtained from 80 acres, giving a yield of 67·7 lb. per acre. As in Canouan, the cotton was sold for the first time to the Central Cotton Ginnery, and the growers appeared to be encouraged by the results from disposing of it in this way.

Here, too, cultivation is conducted according to the metayer system.

UNION ISLAND. This is the most southern of the islands administered from St. Vincent. It is 40 miles distant from it, and is believed to have an area of about 2,600 acres, but is probably larger. As is still the case with Canouan and Mayreau, it was owned privately until recently, when the Government of St. Vincent purchased it under the Land Settlement Scheme. The soil appears to be more fertile than that of Canouan and Mayreau, and is easily worked. No records of the rainfall have been kept, but judging from those of the neighbouring island of Carriacou, it appears probable that this is from 50 to 60 inches.

The chief crops grown are Marie Galante cotton, corn and peas, the cultivation being of the kind described already.

During last season 13,376 lb. of lint was produced from 320 acres, or an average of 42 lb. per acre, which is a fair season's result.

The land has been cultivated hitherto on the metayer system, but since the acquirement of the island by the Government, a scheme has been drawn up by which it is proposed to sell it on easy terms in lots of 2 to 4 acres, and also to dispose of, by sale, 3 blocks of good land, measuring 50 to 100 acres, in different parts of the island, to be worked on estate lines. In addition, land will be conserved as forests reserves.

CARRIACOU. In dealing with this island, the report gives information which is more directly connected with the working of the Land Settlement Scheme there. The soil is derived from limestone and, although it is less quickly affected by drought, it does not seem to be as fertile as that of Union Island.

The methods of cultivation and the crops raised are similar to those of the other islands mentioned, but the metayer system has given place to the selling of land under the Land Settlement Scheme, as is proposed for Union Island. This system has met with a large amount of success and the condition of the people shows signs of a comparatively large prosperity. The cotton raised is sold to the Central Cotton Ginnery.

Reserves for reafforestation have been made on the Land Settlement estates and on hillsides and mountains. In these, the chief seed sown has been that of mahogany.

Other endeavours to effect improvements in the agricultural conditions of Carriacou include the planting of limes on a fairly large scale on private estates, and the establishment of a small experiment station, by the Commissioner, Mr. G. Whitfield Smith, which is intended to aid in the introduction of useful trees and plants, and to provide a means of demonstrating improved methods of cultivation for limes and cotton, which are to be the chief crops raised.

SUGGESTIONS IN RELATION TO SCHOOL GARDENS.

Circular 746 of the Board of Education, England, has just been issued, for the purpose of making suggestions for teachers in relation to the subject of school gardening. It is pointed out that this, when understood rightly, is a branch of nature study, rather than a professional training for an industry, and that its practical nature is likely to make it appeal particularly to the minds of children. The warning is given against allowing the pursuit of nature study to fall into its chief danger—the giving of a disconnected series of object-lessons, which possess neither sustained interest, nor serve as a means of teaching general principles. A good suggestion is made as to the use of reference books by pupils, in order that they may gain the habit of reading for the purpose of acquiring useful knowledge. One of the most valuable parts of the circular is a series of questions, which the teacher should ask himself periodically, in order that he may have a means of satisfying himself as to the thoroughness and efficiency of the gardening work and the garden, as means of education. These are given here, as many of them apply usefully to conditions in the West Indies.

(1) Is the position of the garden satisfactory?

(2) Is the land sufficient in area for serious practical work?

(3) Are the tools suitable and sufficient in number?

(4) Are the tools properly kept?

(5) Are the vegetables grown suitable to the district, and sufficiently various to teach the ordinary operations of cottage gardening?

(6) Is the system of cropping satisfactory?

(7) Is a sufficient quantity and variety of manure used?

(8) Is fruit culture included?

(9) Are flower culture and bee-keeping included?

(10) Is the gardening time-table satisfactory?

(11) Does each scholar work from a scale drawing of the proposed cultivation of his plot made by him beforehand?

(12) Are the manual operations properly taught?

(13) Is the garden, as a whole, kept in good order?

(14) Do the scholars make notes of their garden work?

(15) Is close and accurate observation insisted on?

(16) Is gardening correlated with nature study?

(17) Is gardening correlated with drawing?

(18) Is gardening correlated with arithmetic?

(19) Is gardening correlated with reading and composition.

(20) Are the first, second, and third years' courses of work progressive?

(21) Is the disposition of the produce satisfactory?

(22) Are seeds saved?

(23) Is competition kept within proper bounds?

(24) Is the instruction adapted for girls?

Of these questions, numbers 1 to 4, 6, 7 and 10 to 23 are of special interest in relation to conditions in the West Indies. Particular value attaches to questions 10 to 20, and the extent to which the teacher can answer them constantly in the affirmative, will give him an indication as to the value of his own work and the degree to which advantage is being taken of the usefulness of the garden. Every teacher would do well to keep these questions continually before him; he will thus be enabled to conduct a useful inspection of his own work, while he has at his disposal a simple means of discovering and correcting any deficiencies.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of the present number deals with The Essentials for the Growth of Plants, and shows how the lack or absence of any one of these diminishes or prevents the employment of the others.

The conclusions of interesting articles that have appeared recently on the products that arise from changes in the glucose in molasses are given on page 259.

The subject of the unorthodox methods that are employed at Woburn, in tree planting, has been mentioned already in the *Agricultural News* (Vol. VII, p. 101). It is developed further, on page 261.

Recent suggestions that have been given, in relation to school gardens, are reproduced on page 263. They should be of interest and value to those teachers who are in the fortunate position of possessing a school garden as an educational aid, as well as to those who are intending to acquire one for this purpose.

The Insect Notes (page 266) contain the fifth and last part of the Acarina or Mites.

Information concerning die-back diseases of Hevea, Cacao and the Mango forms the subject of the Fungus Notes, on page 270.

The extract of a report, on page 271, on the damage done to crops by a recent hurricane, should be of special interest at the present time.

Forestry at Edinburgh University.

A syllabus of the forest courses at the University of Edinburgh has been received, which shows that this is the only British University which gives a degree in that subject, at present. This is to be known as the Degree of B.Sc., in Forestry, and for its attainment special courses have to be taken up in Advanced Forestry, Forest Botany, Forest Entomology, Forest Chemistry, and Forest Engineering with Engineering Drawing and Surveying.

The degree courses extend over three academic years, of which two and one-third years are spent in residence. Candidates who do not possess a degree in Science or in Arts, not being an honorary degree, of any of the Universities of the United Kingdom, are required to pass a preliminary examination, which includes English, Mathematics, Latin, and German or French. After this has been passed, the further work for the degree may be taken up; this includes a practical course lasting for six months, which is to be followed, at present, in Germany, under arrangements made for students by the University.

A useful circumstance in connexion with this degree is afforded by the fact that those who possess it will receive special consideration in the selection of candidates for the Indian Forest Service, and there is a possibility that the period of their probation for this will be shortened.

The Effect of Manures on the Quality of Pine-Apples.

An abstract of investigations to determine the effect of manures on the quality of pine-apples, which are described in the *Florida Station Bulletin*, No. 101, p. 29, is given in the *Experiment Station Record* for June 1910, p. 641. This states that it was found that the eating quality of pine-apples, as regards their sugar and acid content, does not seem to be affected by the kind of manure used, although this may have some influence on their shipping quality. The sugar content is slightly increased by additions to the amount of manure, while a very slight decrease of the acid content takes place concurrently. It was found, also, that large fruits contained a greater percentage of sugar than small ones, and that they were slightly less acid. The largest fruits contained the juice in which the ratio of reducing sugars to sucrose was highest. No increase in the nitrogen content of the fruit was obtained by increasing the amount of manure.

The average proportions of the different parts of the fruit, reckoned without the crown, were given as follows, the number of determinations being included in brackets: weight of one fruit (65), 966·2 gm.; edible portion (33), 61 per cent. of whole fruit; available juice (85), 92·8 per cent. of the edible portion; total solids in whole fruit (66), 15·18 per cent.; nitrogen (63), 0·064 per cent. of edible portion; citric acid, reducing sugars, sucrose and total sugars (100 each), 0·98, 2·60, 9·47 and 12·07 per cent. of the juice, respectively.

The West Indies in Canada, 1910.

The booklet, published by the Imperial Department of Agriculture, under the title of 'The West Indies in Canada', has been issued again for use at the Canadian Exhibitions to be held during this month and the next at Toronto and St. John. This commences with general statistics relating to the West Indies, together with a map which is an improvement on that of former issues. The different parts of the West Indies, and British Guiana, are then considered particularly, chiefly under the heads of History, General Description, Industries and Production, Climate and Sanitary Conditions. At the end of this section, there are given lists of books relating to the West Indies and British Guiana, and information regarding the Steamship Service between the West Indies and Canada. The last twenty odd pages of the booklet are devoted to descriptions of the products of the West Indies and British Guiana, with illustrations of some of the chief plants and processes, printed, for clearness, on art paper.

As has been found in the past, this publication should be of use in helping to draw attention to the possible directions in which trade may be increased between the West Indies and Canada.

Carbon Bisulphide for Killing Weeds.

A recent Press Bulletin issued by the Hawaii Agricultural Experiment Station deals with experiments which are being undertaken for determining the efficiency of carbon bisulphide as a weed killer, and an abstract of this is given in the *Natal Agricultural Journal* for May 1910, p. 605. It appears from this that the amount of carbon bisulphide used in the experiments varied according to the size of the plant to be destroyed. Small-stemmed plants, like Crotalaria, were treated with about a teaspoonful of commercial carbon bisulphide, which was poured down the stem from about 6 inches above the ground; larger plants received increased amounts, up to two teaspoonfuls for guava bushes having a stem 3 or 4 inches in diameter, the liquid being poured, as in the case of the small plants, on the stem at about 6 inches above the surface of the soil. It was found that carbon bisulphide shows no effect on most plants until a considerable time after application; this period extended sometimes, in the case of large guavas, to two or three months. With Crotalaria the plant dies within four to ten days. Death takes place suddenly; the treated plants remain green and appear to be normal until the leaves suddenly turn yellow and shrivel up, when they die.

Indications were obtained that the cause of death is a freezing action due to the quick evaporation of the carbon bisulphide, combined with a poisonous effect. That the latter is not alone potent was shown by removing the bark and cambium from the stem of guava bushes, or by destroying them with sulphuric acid, when the plants took much longer to die than if they had been treated with carbon bisulphide in the way adopted in the experiment.

Attention is drawn to the care that is required in avoiding the breathing of the vapour of carbon bisulphide when it is used for this and similar purposes. It has been found that the effect of the vapour, when it is breathed, is to cause headache, giddiness, hysterical excitement, and finally, serious sypmtoms of prostration. There should be no necessity to repeat the warning as to using carbon bisulphide under conditions in which the vapour cannot mix with air in the presence of a naked flame or a hot surface.

Agricultural Returns of Canada, 1909.

The *Monthly Trade and Consular Reports* for June 1910 quotes official final estimates, which show that the value of all crops in the Dominion of Canada during 1909 was $532,992,100, which is an increase over that of 1908 of $100,458,100; the area of land cultivated last year was 30,065,556 acres. The largest output took place in relation to wheat and hay, the amounts being respectively, 166,744,000 bushels, valued at $141,320,000, and (estimated) 11,877,100 tons, valued at $132,287,700. The value of the other crops produced in any quantity is given as follows: oats $122,390,000; potatos $36,399,000; barley $25,434,000; turnips and other root crops $18,197,500; fodder corn $15,115,000; husking corn $12,760,000; mixed grains $10,916,000; peas $7,222,000; buckwheat $4,554,000; flax $2,761,000; beans $1,881,000; rye $1,254,000; sugar beets $500,000.

The values of the crops produced by the different provinces were in the following order, beginning with the highest and excluding British Columbia: Ontario, Saskatchewan, Quebec, Manitoba, Nova Scotia, Alberta, New Brunswick and Prince Edward Island.

The Preservation of Copra.

A note on methods for preserving copra from moulds was given in the *Agricultural News*, Vol. VIII, p. 297, and experiments were mentioned that had been conducted at the Paris Colonial Gardens for effecting this by the use of sulphurous acid. In connexion with these experiments, the *Tropical Agriculturist* (see Vol. XXXIV, p. 379) has made application, on behalf of a mercantile firm in Colombo, to the Director of the Paris Colonial Gardens for the purpose of obtaining further information. This enquiry elicited the fact that the process is based on the employment of the apparatus Marot, which is owned by the company known as Le Coprah, of Paris. It was ascertained, further, that the treatment is based on the sterilization of the pulp of the cocoa-nut before it is dried, so that perfect preservation is obtained, and a copra is produced which is absolutely white and without trace of rancidity. It is stated that this gives an added value to the product of about 2*s.* or 3*s.* per cwt. The machinery is not sold ordinarily by the company, but licences are granted by it, under certain conditions, to other companies which have been formed for the purpose of exploiting the processes.

INSECT NOTES.

THE ACARINA OR MITES.

PART V.

SARCOPTIDAE. In this family are included all those parasitic mites which cause the diseases known as itch, mange and scab, each species being specially adapted to some particular host. They live on the surface of the skin, or burrow into its tissues, and in some cases even infest the quills of feathers. The various forms of itch and mange in the human species and in horses, dogs and cats, are due to the attacks of these mites, as are also the scaly leg of fowls, and the very important disease known as scab in sheep. Sheep scab (*Psoroptes communis*, var. *ovis*) is perhaps the most important of all the mites of this family. Its distribution is practically worldwide, and its control in infected areas requires constant effort. The mite and its eggs are easily to be seen in the scab of infected sheep. The adult mites have a rounded body, and the legs are provided with long hairs or bristles. The eggs are very minute, glistening, white bodies, which may serve for the identification of the pest, even though the mites themselves are not found.

Another form of parasitic mite is to be found in the follicle mites, *Demodex folliculorum*, which live on man and certain domestic animals. These mites are worm-like in appearance, and in this they differ from all those so far considered. One occurring on pigs gives rise to a peculiar appearance of the skin, which, if not recognized as being due to a parasite of this kind, may cause suspicion as to the suitability of the flesh for eating purposes. Except in cases of extreme infestation, they are not of great importance; but those that attack cattle sometimes become sufficiently abundant to damage seriously the hides in relation to leather-making. The entire life-history of these mites is passed in the hair follicle, but but the adult probably migrates over the surface of the skin for the purpose of egg-laying.

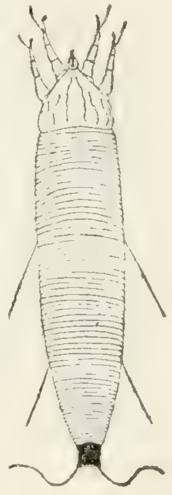

FIG. 35. ERIOPHYES GOSSYPII.

ERIOPHYIDAE. The Eriophyidae differ in appearance from the mites of all the other families. They are elongated in shape, microscopic in size, and present the appearance of having a cephalothorax and an abdomen, the division being indicated by a distinct suture. They are provided with two pairs of legs, the other two pairs normally present in the mites being represented by stiff hairs or bristles. The general shape of the body is similar to that of Demodex, from which they are distinguished by the number of pairs of legs, and their plant-infesting habits.

The members of this family are parasitic on plants, and are known as gall mites, or leaf-blister mites, on account of the peculiar distortions of plant tissues which they produce. Each species of mite seems to favour some particular host plant, and to produce its characteristic gall or deformity, by which it may generally be recognized. In the West Indies, the most important of these mites is *Eriophyes gossypii* (Fig. 35) which attacks cotton. It occurs in all the islands of the Lesser Antilles, except Barbados, attacking both wild and cultivated cotton. It has sometimes been such a serious pest of Sea Island cotton as to destroy entire fields of this crop.

The adult mite enters the leaf bud of the young cotton-plant, and when these develop, and the leaves are unfolded, the characteristic galls (Fig. 36) are seen. These galls are produced by the irritation caused by the feeding of the mites on the ventral surface of the leaf. This irritation also induces a growth of fine hairs within the gall, among which the mites live.

When the mites are fully developed, they leave the galls and wander about in search of leaf buds in which to establish new colonies.

The remedial measures at present in use for the control of the leaf-blister mite are entirely cultural, and consist in the thorough destruction of all the old cotton two or three months before planting the new crop. This method, combined with the picking-off of infested leaves as they appear on the young cotton, has been found to reduce the numbers of the mite to such an extent as to render it practically harmless. Sulphur and lime in equal parts, dusted on the plants at the time when the mites are migrating from one part to another, will be found very useful in checking the increase of this pest.

Other species occurring in the West Indies are *Eriophyes bucidae* which causes the bright-red, felt-like growths on the leaves of *Terminalia Buceras*; *Eriophyes morrisi* which causes the spheroidal swellings on the leaves of *Acacia farnesiana* and other species; and *Eriophyes striatus* which occurs on *Eupatorium odoratum*.

This article completes the series dealing with the Acarina, or Mites, which was commenced in No. 213 of the *Agricultural News*. As was stated in the introduction to Part I, the object of these articles has been to give definite information concerning forms of life that are popularly regarded as insects, but which cannot be strictly included among them.

FIG. 36. SECTION THROUGH GALL MADE BY ERIOPHYES GOSSYPII.

It was necessary, in Part I, to recapitulate the fact that the arthropods, or animals with jointed legs, contain four classes, of which the crabs, the spiders, the centipedes and the insects form the broad types; and as the Acarina, or mites, belong to the second of these—the one containing the spiders—this was described under its usual name, Arachnida, a short account of the different orders being given.

This cleared the way for the consideration of the Acarina, commenced in Part II of the series, and after a general description of the order had been presented, its different families were enumerated, the remainder of the article being taken up by an account of the Trombididae, or spinning mites, of which the most interesting are the red spiders, the jigger (or chigoe) and the bête rouge.

Part III dealt with the Gamasidae and the Ixodidae, the former of which include the poultry mites, while the latter family is especially interesting, as it includes the ticks—the largest among the mites. Special attention has been given to finding cheap and effective means of getting rid of ticks. Some of these are indicated in Parts III and IV; and it may also be stated that particular information relating to freeing pastures from ticks is given on page 157 of the current volume of the *Agricultural News*.

Parts IV and V, the latter of which deals with the important family Eriophyidae (leaf-blister mites), conclude a series of articles which, it is hoped, will be found useful in giving information concerning several groups of pests that cannot be classed properly as insects.

SOY MEAL AND CAKE AS CATTLE FOODS.

The *Monthly Consular and Trade Reports* gives the following translation of an article on soy meal and soy cake, which is based on results obtained at the Central Institute for Agricultural Experiments, Sweden:—

In connexion with the now concluded experiments with soy meal and soy cake, in order to find their value as cattle food, a series of analytical tests has been made regarding the chemical composition of these fodder stuffs. Similar analyses, made by the managers of the bureaux of chemistry located in the parts of the country where the soy feeds have already come to be extensively used, have also been submitted, so that the mean figures give the average results from analyses of twenty samples. According to these tests, the average composition of the soy foodstuffs is as follows:—

	Soy cake.	Soy meal.
Water	11·11	11·56
Raw protein	43·29	45·48
Raw fat	6·10	1·88
Carbohydrates	34·04	35 33
Ash	5·46	5·75
Total	100·00	100·00

Lately, soy-cake meal, sometimes called bean gluten feed, has also appeared in the market, and differs from ordinary extracted soy meal in so far that it contains the same percentage of fat as the soy cake.

By reason of their low percentage of cellulose, which, according to the tests, varies from 2·67 to 5·27 per cent., the soy foodstuffs are highly digestible. In this respect, the soy cake seems to be somewhat better than the soy meal, but in comparison with other fodder stuffs both rank very high.

When the percentage of water has been low enough, neither soy cake nor soy meal has undergone any changes during four to five months' storage On the other hand, two samples of meal which contained 15 per cent. of water, and were kept for some time, got mouldy and showed signs of decomposition Therefore, buyers should be careful, and see to it that the moisture does not exceed 13 or 14 per cent.

In the feeding experiments made, it has been shown that soy cake as well as soy meal are eagerly consumed by neat cattle, and daily rations as large as 3·3 lb. to 4·4 lb. have not caused any unfavourable dietary effects. In this respect, the soy fodder stuffs seem to have a slightly loosening effect, comparable to that of good sunflower or ground nut cakes.

Soy cake, as well as soy meal, has higher fodder value than ordinary sunflower cake, and, through experiments, it has been found that 0·90 kilo. (kilo. = 2·2 lb.) of soy cake, or 0·95 kilo. of soy meal, is, on an average, an equivalent substitute for 1 kilo. of sunflower cake. On the two experimental farms, the soy cake gave nearly identical results, while the soy meal, by reason of varying composition, gave figures ranging from 0·91 to 0·99 kilo. Counting 0·91 kilo. of sunflower cake as one fodder unit, the experiments have shown that, for practical purposes, 0·85 kilo. of soy meal or cake, of usual composition, can be counted equal to one fodder unit.

With reference to the influence of the soy fodder stuffs on the percentage of fat in the milk, the results of the experiments are conflicting. Some of them show decrease, others increase. If we compare the results here with those obtained in Germany, we are inclined to believe that the soy foodstuffs have some tendency toward lowering the percentage of fat in the milk produced, still, not in such a degree as to be of any practical importance.

No change in the appearance or taste of the milk has been detected, but the churning tests made in the summer time have shown that the butter had a pronounced fodder taste when larger quantities of soy meal or cake were used. Therefore, at places where the milk is utilized for the production of butter, the daily ration of soy meal or cake given to each cow should not exceed ½- to ¾-kilo.

With the limitation required on account of the abovementioned unfavourable effect on the taste of the butter, soy meal and cake may be considered as good foodstuffs for milch cows, and deserve the farmer's attention, as they can be obtained at a price somewhat lower than that for good ground nut cake, and not appreciably higher than for sunflower cake.

AN APPARATUS FOR SOIL STERILIZATION.

A very effective plant for the sterilization of soil for the purpose of securing a pure seed bed consists of a shallow pit, 18 inches in depth, floored with bricks. The walls are formed of 9-inch brickwork, and divided into two compartments by a single-brick partition. Each of these compartments has a capacity of 2 tons, only one being used at a time, so that whilst one lot of soil is being sterilized the other one is being filled.

The method adopted for the production of the necessary heat is a simple one. Steam is supplied by means of a small portable boiler worked at a pressure of between 25 to 30 lb.; ¾-inch piping is led from the boiler to the floor of each pit, where it is joined to a T-piece, and from the T-piece in each of the pits six pipes are let into spaces between the brickwork on the floor, somewhat resembling the prongs of a large fork. The pipes in the spaces of the brickwork are lightly covered with sand. They are 8 inches apart, are plugged at the ends farthest from the boiler, have a fall of 1 inch, and are perforated along one side by $\frac{3}{16}$-inch holes, 3 inches apart. To carry off the condensed steam, a drain is provided of ordinary tiles. It runs along the whole length of the pits close to the plugged ends of the steam pipes, is buried in cinders an inch below the surface, and has a fall of 2 or 3 inches. Two valve taps enable the operator to turn the steam into the desired compartment.

The soil or other substance to be sterilized is placed in one of the pits. It is then covered with sacking, and the steam turned on for a period of about two hours. The sacking prevents the too rapid escape of the steam from the surface, and raises the whole mass to a higher temperature and in a shorter time than it would otherwise attain were it left uncovered. When the upper layers reach a temperature of 212° F., it is allowed to steam for thirty minutes, the whole operation occupying a period of two and a half hours. The second compartment having been prepared during the sterilization of the first one, the steam is cut off from the latter and turned on to No. 2, and in this manner the sterilization of the soil proceeds without interruption.

As soon as the soil taken from the sterilizer is sufficiently cool, it is ready as a seed bed. When it is necessary to sterilize cow or stable manure for the purpose of killing weeds, etc., it is treated in like manner, but on removal from the pit it is desirable to spread it out in a layer of 4 inches to dry it somewhat.

When once a sterilizing plant of this description has been fixed in position, the operation can be carried out at little more than the cost of the labour, for it is a convenient method of disposing of the accumulations of leaves, pieces of wood, and other refuse. (The *Journal of the Department of Agriculture of Victoria*, Vol. VIII, p. 366.)

GLEANINGS.

At a special meeting of the Montserrat Agricultural Society, held last month, his Excellency Sir E. Bickham Sweet-Escott, K.C.M.G., Governor of the Leeward Islands, consented to become the Patron-President of the Society.

The *Mark Lane Express*, No. 4,084, p. 11, contains an article in which attention is drawn to experiments that have demonstrated that an increase takes place in the efficiency of superphosphate as a plant food, if it is mixed with well rotted farmyard manure.

The reports of the Agricultural Instructor, St. Vincent, for May and June of the present year, show that successful work is being done in that island in the matter of using mechanical implements for purposes of cultivation, and that in parts of the island, the area planted in cotton during this season has increased.

In connexion with the article on page 101, of the current volume of the *Agricultural News*, entitled Why Plants are Green, attention is drawn to an editorial, dealing with the same subject, in the *Gardeners' Chronicle* for January 15, 1910, from which suggestions were taken for the first-mentioned article.

An account of the Cyclone Tractor, which is being exploited in Africa by the African Union Transport Company, Ltd., is contained in the *Natal Agricultural Journal* for May 1910, p. 487. From this, it appears that the tractor is of simple construction and easy to work. The price of a machine of 25 to 30 h.p., in London, is £425.

A recent report of the Sudan Central Economic Board states that the area in cotton cultivation in the Blue Nile Provinces has considerably increased of late, chiefly owing to high prices and the making of the railway. The Government is proposing to issue seed to cultivators in order to encourage the production of cotton by them.

Information received from the Curator of the Montserrat Botanic Station shows that a good stand of cotton has been obtained over the greater part of the island, but that rain has been required on the windward coast and in the northern district. The total area of cotton planted is larger than that of last year, and there is increased activity among the small growers.

The amount of cotton lint exported from the Uganda Protectorate during the first three months of the present year was 13,197 cwt., of a value of £37,416; the similar figures for 1909 were 10,247 cwt. and £30,003. The unginned cotton exported during the same period amounted to 29,922 cwt. and 12,806 cwt., valued at £22,180 and £11,229, respectively.

The value of the raw sugar imported into the United Kingdom during the first six months of the present year was £6,700,375; during the same period last year, it was £4,258,961. In the first-mentioned period, most of the sugar was obtained from Cuba and Germany, while the value of that imported from the British West Indies, British Guiana and British Honduras was £784,504

A small booklet containing descriptions of the exhibits by the Wellcome Chemical Research Laboratories at the Japan-British Exhibition, London, 1910, has been received. This is especially useful because of the references to the literature concerning the active principles of plants which it contains, and on account of the information which is given concerning the substances that have been isolated from the different parts of various plants.

A note stating that there was evidence that bacteria have some effect in hastening the corrosion of steel in soil was given on page 252 of the last issue of the *Agricultural News*. In relation to this, information which appears in the *Sugar Beet* for July 1910, p. 163, shows that bacteria also have an action on coal, producing changes, with the liberation of carbon dioxide, which do not occur if the coal is protected from the action of such organisms.

The *Board of Trade Journal* for June 23, 1910, states that information has been received from a reliable source, which shows that a by-product in the manufacture of terpineol, called Terpinolene, is being used in Catania (Sicily) and neighbouring districts for the purpose of adulterating essence of lemon, orange and bergamot. Terpinolene is said to be made in Marseilles for this purpose alone; it is entirely harmless and cannot be detected in the oil unless the quantity present is greater than 12 per cent.

The Earl of Crewe, Secretary of State for the Colonies, while presiding over the eleventh dinner of the Corona Club, on July 7, stated that, if he were asked to select the Imperial object to which a large sum of money could most profitably be devoted, he would name without hesitation the question of research into the causes of tropical diseases of men, animals, and in the vegetable kingdom—research, of course, with a view to discovering means of prevention and cure. (The London *Standard*, July 8, 1910.)

The *Jamaica Gazette* for June 9, 1910, shows that a proclamation has been made under the Seeds and Plants Importation Law, 1884 (Jamaica), and A Law in Aid of the Seeds and Plants Importation Law, 1884 (Jamaica), which is Law 25 of 1891, by which is prohibited, until further proclamation, the importation into Jamaica of any banana plants, suckers, cuttings, or earth, packages or tools having any connexion with them, coming from all countries of Central or South America and the island of Trinidad.

Arrangements have been made by which part of the lawns at the St. Kitts Botanic Station, which were made for use as recreation grounds for properly organized clubs, or for schools, have been set apart for the use of the Basseterre Lawn Tennis Club and the Girls' High School. This has been done by rescinding Rule No. 9, Section 3, of the Botanic Garden Regulations Ordinance 1900 (St. Kitts-Nevis), and by substituting a rule which allows games to be played, with the permission of the Curator, on such terms and for such fees as he may from time to time prescribe.

STUDENTS' CORNER.

AUGUST.

Third Period.

Seasonal Notes.

The disease of cotton known as 'black arm' is prevalent to some extent in the West Indies. In its ordinary manifestations, it attacks a small area of the stem, or a branch, which becomes brown in colour, gradually darkens, and finally leads to the bending over of the stem or branch affected. Examine cotton fields for evidence of the presence of this disease, and where it is found, try to discover if there is any connexion between the prevalence of it and that of black boll and anthracnose. In Barbados, more especially, it will be well also, to make observations for the purpose of tracing any connexion that may possibly exist between the attacks of the disease and those of the red maggot.

When the cotton plants begin to bear bolls in any quantity, it may be noticed that a large number of them are dropped, while they do not show any definite signs of disease. On the occurrence of this, the presence of the condition should be considered in relation to the state of health of the plants, and to the rainfall at the time. The reason why a plant drops its fruit, though this is still healthy, is because the amount of nutritive material that is being made is insufficient for the maturing of the number of fruits already on it. This interference with nutrition may arise from a diseased condition of the plant which prevents food substances from being carried through it properly, or does not allow the leaves to exert their function of assimilating carbon to a sufficient extent; or it may be caused through the effect on the plant of a sudden fall of rain or a quickly on-coming drought. In the first case, the plant must be helped as much as possible by adopting means for getting rid of the pests. There is no artificial remedy for the second condition; it is a natural state, and is probably beneficial in the long run; for though the number of mature bolls given by the tree will be fewer than if many of them had not dropped, the tree itself has managed to conserve its strength, and the fewer bolls that ripen will give better cotton than would have been received from the many, had they not dropped to some extent.

Yams should be examined carefully for the presence of a disease, called 'blight' in Barbados, which is probably due to bacteria. Where it is found, specimens showing symptoms of the attack should be forwarded to the chief agricultural officer of the colony, for transmission to the Head Office and examination by the Mycologist. An interesting experiment on the yield of yams may be performed by staking about a hundred holes, so that the aerial stems may climb, and comparing the yield from these with that from a hundred neighbouring holes where stakes have not been put in. At the end of the experiment, it will be of interest to find reasons for the difference in the weights of tubers given in the two plots. Compare the structure of the yam tuber with that of the root of the sweet potato, and of the bulb of the onion. What is the true nature of the 'eyes' on a yam, and what usually happens to them when it is put into damp soil.

Sweet potatos will soon be put in, for the next crop. Note whether the cuttings planted are obtained from plants grown from roots, or from those raised from cuttings. It will be of interest to plant cuttings of the two kinds, in different plots under the same conditions, and to weigh carefully the produce obtained in the two cases. Why is it that, although the underground part of a sweet potato is not a tuber, it can be used for the production of new plants? Examine the different kinds of sweet potatos grown in your district. Ascertain the local name of each kind, and write a careful description of it. Such careful descriptions, with local names, would probably be of great use if they were communicated to the officers of the Department.

Where shade has been provided already, by the growing of bananas and tanias, the planting of cacao will now be in train. While this is being done, it is of the utmost importance to make sure that the drainage is good, as cacao is one of the first plants to show ill effects from the continual presence of too much water in the soil. Remember that drains are almost useless, even when they are sufficient in number, unless they are deep enough. They have to remove a great deal of the water that is on its way through the soil, and if they are wanting in depth, much of this will be able to pass down to levels from which they cannot remove it. For what purpose, in cacao cultivation, may drains be used, besides that of the removal of water?

Mature cacao trees are now flowering for the Christmas crop. Examine the structure of the cacao flower, and make observations on it for the purpose of deciding how it is pollinated On what kind of structure, and on what parts of the plant, are the flowers borne? Discuss the importance of the exercise of care in picking cacao, in relation to the production of flowers for the next crop.

In a cacao plantation, the signs that any of the trees are suffering from the wind are unmistakable, and where they are seen, no time should be lost in providing effective windbreaks. It is at the present season that vacant places in the plantation should be filled. Care will be required now, especially, to prevent the spread of wood ants, and the nests will be poisoned by means of white arsenic, with precautions against the picking up of the poison by other animals. As has been indicated already, the grafting of selected varieties of cacao may now be done. Keep a watch for cacao canker, and in this connexion read carefully the two recent articles in the *Agricultural News* (pp. 222 and 238), which contain interesting information in relation to this disease.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State what you consider to be the best method of manuring for sweet potatos, giving reasons.

(2) To what special characteristics does farmyard manure owe its great value?

(3) What are the chief grasses used in your district for fodder, and how are they respectively affected by dry weather

INTERMEDIATE QUESTIONS.

(1) What parts of an ordinary soil have the greatest influence in retarding the loss of water?

(2) State the symptoms of areolate mildew of cotton, and describe briefly the fungus causing it.

(3) Give as many reasons as you can for pressing down the surface of the soil after planting seeds.

DEPARTMENT NEWS.

Mr. W. N. Sands. Agricultural Superintendent of St. Vincent, left for Canada, on the 8th instant, for the purpose of assisting in advancing the interests of the West Indies at the forthcoming Canadian Exhibitions at Toronto and St. John, especially in the matter of extending trade between these colonies and the Dominion.

FUNGUS NOTES.

DIE-BACK DISEASES OF HEVEA, CACAO AND MANGO.

The die-back disease of cacao is one that has long been known in the West Indies, and has been the subject of several publications, not only from this Department, but from many parts of the tropical world. Recently, a disease of Hevea, characterized by symptoms somewhat similar to those exhibited by cacao, has been described by Petch from Ceylon, in Vol. IV, No. 23, of the *Circulars and Agricultural Journal of the Royal Botanic Gardens*; a similar disease attacking mangos has been observed in Barbados, and could probably be found in most of the West Indian islands, especially on young grafted trees of the more highly developed varieties. Although the disease upon this last host plant has not been fully worked out, enough has been seen to make it worthy of mention here, more especially in the light of what has recently been found to be the case in Hevea disease in Ceylon. In order to explain the situation clearly, each disease will be treated separately, commencing with that on Hevea.

HEVEA BRASILIENSIS. The disease was first investigated at Peradeniya in 1905, at which time it was essentially a disease of young trees from one to two years old. During 1909, however, it was found on trees from nine to fourteen years old, and in some instances these were killed very rapidly. The symptoms of the disease on young trees are as follows: a brown patch, which is frequently rather soft, is formed on the leading green shoot about the middle of its length. This patch extends over the whole shoot, and the leaves fall off as the disease reaches them. As the causative fungus spreads in the tissues, the parts first attacked dry up and become grey in colour. If the diseased parts are removed at this stage, very little harm results, as growth is continued from the uppermost remaining bud; but if the disease is neglected, the secondary stage sets in, and the tree dies. The fungus which causes the first stage of the disease is known as *Gloeosporium alborubrum*. Its fructifications appear as minute swellings, produced immediately beneath the epidermis of the dead shoot. These burst at the top, and thin tendrils of pink or white spores are extruded. The second stage of the disease is due to *Lasiodiplodia theobromae*, which is better known in Ceylon as *Botryodiplodia elasticae*, as this is the name under which it was originally described, in that island. On older trees, the diagnosis of this disease is a matter of more difficulty than in the case of the young plants, as the shoot may die off, from numerous causes. It may, however, be recognized by the fact that once the second stage has commenced, the whorls of branches are killed off in succession. In the case of both young and old trees, the second fungus, *Lasiodiplodia theobromae*, can only obtain a hold on the tree after the leading shoot has been killed by the Gloeosporium. Having once obtained a hold as a saprophyte, it can spread rapidly, and can attack the hard, woody parts which are able to resist the Gloeosporium. In this way, it brings about the death of the host, often in a fairly short time.

MANGO. In the *Cuba Review*, Vol. VIII, No. 5, a short account is given of a bloom blight, the symptoms of which are as follows: as the blossoms open they rot, becoming black in colour, and finally dry up and fall off, leaving only the central stalk. This also dries up and turns brown. The disease, in Cuba, is due to a fungus known as *Gloeosporium mangiferae*, and is related to that found on Hevea. Recently, portions of diseased mango, including the inflorescence, were examined at the Head Office of the Department, and it was found that the external symptoms were very similar to those just described. When some of these twigs were kept in a damp chamber, they developed numerous fructifications of *Lasiodiplodia theobromae*, and it seems probable, though this has not been definitely established, that the latter fungus was of secondary origin, and prevented the true cause of the disease from appearing. Young mango trees are subject to a disease which attacks the green shoots, causing them to become brown and hard, as in the case of Hevea; though up to the present, the disease has not been sufficiently carefully investigated to make it possible to state definitely at what point the attack commences. One or two instances of this disease have been noted in Barbados. In view of the facts mentioned, it seems possible that there is here a case parallel to that described by Petch, namely that a Gloeosporium starts the disease, and that if no remedial measures are undertaken, this is followed by *Lasiodiplodia theobromae* which can then complete the destruction of the tree.

CACAO. The die-back disease on this host plant is too well known to require much detailed description. As far as is known at present, only one fungus, *Lasiodiplodia theobromae*, is concerned with the spread of this disease, and there is no previous direct attack by any other. In consequence, it is found here, that the disease is practically confined to trees, the young branches of which have been damaged by wind, bad drainage, unsuitable soil conditions, excessive sunlight and similar causes. The same was also found to be the case in Surinam, by Mrs. van Hall and Mr A. W. Drost. (See *Agricultural News*, Vol. IX, p. 46). Once established on dead and dying twigs, the fungus can spread downwards into the branches and main stem, and will eventually kill the tree.

The remedial measures in the case of the rubber and cacao diseases, and probably also in that of young mangos, are exactly similar. They consist in the careful removal of diseased twigs and branches, followed by the careful tarring of the wounds made. In removing large branches, Petch suggests that three cuts should be made with a saw. The first is made 1 foot from the stem on the under surface of the branch, and about half through it. The second is made about 3 inches further from the trunk on the upper surface, and is continued until the branch breaks off. Finally, the stub must be sawn off quite close to the stem, by a cut running parallel to the stem. Before the tar is applied, the cut surface should be allowed to become as dry as possible, but it should not be exposed for more than twenty-four hours. All the parts removed should be burnt. The bloom blight of mangos can be controlled by two thorough sprayings with Bordeaux mixture at a fortnight's interval. The first should probably be done just as the flowers are commencing to open.

In conclusion, it may be stated that dying back of twigs both in Hevea and in cacao may be due to many other causes besides those mentioned, notably to root disease. In this case, an examination of the roots and collar will frequently reveal the true cause of the symptoms observed. In the case of cacao, die-back due to physical or physiological causes can usually be distinguished from that due to Lasiodiplodia, by the fact that the line of demarcation between healthy and unhealthy tissue in the first case is quite sharp, while in the second it is indefinite. It is often difficult to distinguish between the diseases originally fungoid in origin and those primarily of a physiological nature; but in either case, removal of the dead parts, especially if they become numerous, is the wisest course to adopt.

DAMAGE TO CROPS BY HURRICANES.

The following interesting information concerning the damage that may be suffered, during a hurricane, by different crops, is contained in a report on the recent hurricane in Fiji (March 1910), by the Governor, Sir Everard F. im Thurn, K.C.M.G., issued as *Colonial Reports, Miscellaneous*, No. 72:—

Turning now to the subject of growing crops, on which so much of the prosperity of these islands depends, I will deal first with crops grown for export, and then with those grown to supply the natives with food.

With regard to sugar, the cane fields on the Rewa river, unfortunately very extensive, were alone subject to the full force of the wind. I am told, on good authority, that the estimated loss of these will probably amount to about 25 per cent. The greater part of the Fiji banana crop is grown within the affected area, and the damage to this has been very severe. I am told that the value of this crop, as it stood immediately before the blow, has now been reduced by 50, or perhaps 60, per cent. The crop is an important one to Europeans engaged in dealing with it, and it is still more important to the native growers, who have recently derived from it the greater part of their ready cash. It is, however, a rapidly maturing crop, which will probably recuperate in less than a year. Cocoa-nuts, or at least those from which copra is derived, are for the most part grown in parts of the islands outside the influence of the recent hurricane, with the probable result that the output for this year will be but little reduced, though, owing to the destruction of a considerable number of very young nuts in those parts of the Lau Islands where the force of the wind was great, the output for next year may possibly be somewhat more seriously affected. One of the largest growers of cocoa-nuts told me, however, two days ago, that he estimated the loss on the copra crop, over the whole group, as not more than from 2 to 5 per cent. On the whole, therefore, the loss on the export crops is probably not very excessive.

It may be well that I should here explain, that india-rubber, though it has been somewhat extensively planted, and though the tendency to plant rubber (Para) in Fiji has latterly shown signs of increase, is nowhere in these islands, I think, ready for tapping. I had always supposed that the one danger which would probably attend rubber-growing in Fiji would be the breaking of these somewhat brittle trees by hurricane winds. I am glad, therefore, to report, that our young rubber trees suffered very little on the occasion of the recent blow. The leaves—as was practically the case with all leaves throughout the storm area—were entirely stripped; but the branches, probably because of the stripping of the leaves, and the main stems were very little broken. It is remarkable, though I am not satisfied that any sequence of cause and effect is thereby indicated, that almost the only rubber trees which were much broken were certain trees at the Government station at Nasinu which had been 'topped' at an early stage of their growth. This treatment resulted in an increase in the size of their 'heads,' as well as of their stems, and possibly a correlative greater liability to damage from wind.

The food crops of the natives—I am still referring only to the storm area—have certainly been much damaged, though perhaps not to the extent which is at present supposed. The most deplorable loss is that of the bread fruit, a very great crop of which was almost ready for use. Only a few weeks ago, in riding through a large Fijian village, I was admiring a heavier crop of this splendid fruit than I had ever before seen; but in an an hour or two, the hurricane, where it passed, had utterly destroyed both leaves and fruit of these noble trees. Taro and dalo (*Colocasia esculenta*)—important root crops of the Arum family—were almost entirely destroyed. But luckily, the yam crop, owing to the accident of its being matured, was but little damaged, and will probably help to tide the Fijians of the affected area over their difficulties

YIELD FROM CEARA TREES IN UGANDA.

The Assistant in the Botanical Forestry and Scientific Department, Uganda, gives the following report, on the tapping of Ceara rubber trees on a plantation in that country, which appears in the *Official Gazette of the Uganda Protectorate*, June 15, 1910:—

On April 16 last, I took the girth measurements of twenty trees at a height of 3 feet; the average girth of these trees was 19 inches, the largest being 26 inches and the smallest 16 inches. On the same date I tapped these on the 'half herring-bone' system.

Tapping was done to a height of 3½ feet, and from the system adopted, it will be seen that only half of each tree was tapped. The trees are approximately two years and nine months old.

The trees were tapped every alternate evening, between the hours of 5 and 6.30 p.m., for a period of one month. Each tree was tapped fifteen times. The flow of latex was encouraged by paring and pricking, and wound response was excellent throughout the experiment.

The quantity of dry rubber obtained is 2 lb. 5½oz., of which 1lb. 14½oz. is biscuit rubber, the remainder being composed of the latex, which coagulated in the cuts and was collected as scrap rubber. The above represents an average yield of 1oz. 14dr. per tree for the period, and allowing that tapping could be done on 180 days per year, this would represent an annual yield of 1lb. 6½oz. per tree, which is exceedingly good, considering the growth of the trees, and the fact that they have been tapped to a height of 3½ feet, and that only one-half of the tree was tapped. A very weak solution of formalin was added as a preservative, and the latex was coagulated, in enamel plates, by adding a weak solution of acetic acid.

A few trees gave much higher yields than others, and this clearly demonstrates the necessity of selecting seed for propagation from the trees which yield the largest quantity of latex.

Demerara Seedlings in Louisiana.—The growing crop is fortunately composed of a very large proportion of the imported seedlings D.74 and D.95. With a good chance, these varieties of cane make astonishing advances in their relative condition in some growing seasons: and in the harvest they very largely exceed the yields of the old home cane per ton. The superiority of the new canes may go more than is expected to make up the probable or certain deficiency in the present crop. But, as we have previously observed, whatever may be the conditions of work and weather from now on, this year's cane crop can never be turned into a good one. (The *Sugar Planters' Journal*, July 2, 1910).

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 2, 1910; Messrs. E. A. DE PASS & Co., July 22, 1910.

ARROWROOT—St. Vincent, 1⅞*d.* to 2*d.*
BALATA—Sheet, 4/-; block, 3/2 per lb.
BEESWAX—£7 10*s.* 6*d.*
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 48/- to 53/-; Jamaica, 46/6 to 51/6.
COFFEE—Jamaica, 43/6 to 51/6.
COPRA—West Indian, £27 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 59/- to 65/-.
HONEY—25/6 to 31/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/2; concentrated, £18 10*s.* to £18 15*s.*: Otto of limes (hand pressed), 6/-, nominal.
LOGWOOD—No quotations.
MACE—1/6 to 2/-.
NUTMEGS—Quiet.
PIMENTO—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
RUBBER—Para, fine hard, 9/1, fine soft, 8/9; fine Peru, 9/- per lb.
RUM—Jamaica, 1/10 to 5/-.
SUGAR—Crystals, 17/- to 19/-; Muscovado, 13/- to 14/9; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co, July 22, 1910.

CACAO—Caracas, 11c. to 11⅛c.; Grenada, 10¾c. to 11c.; Trinidad, 11c. to 11¼c.; Jamaica, 9c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, no quotations; culls, no quotations; Trinidad, select, $32·00; culls, $18·00 per M.
COFFEE—Jamaica, ordinary, 8½c. to 8¾c.; good ordinary, 9c.; and washed, up to 11c. per lb.
GINGER—9½c. to 12½c. per lb.
GOAT SKINS—Jamaica, 55c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—No quotations.
LIMES—$4·50 to $6·00.
MACE—30c. to 36c. per lb.
NUTMEGS—110's, 8¾c. to 9c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4¼c. to 4⅜c. per lb.
SUGAR—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid

Trinidad.—Messrs. GORDON, GRANT & Co., August 6, 1910.

CACAO—Venezuelan, $10·80 to $11·00 per fanega; Trinidad, $10·65 to to $11·00.
COCOA-NUT OIL—$1·14 per Imperial gallon
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$4·35 to $4·40.
ONIONS—$2·00 to $2·25 per 100 lb.
PEAS, SPLIT—$6·00 to $6·10 per bag.
POTATOS—English, $1·25 to $2·00 per 100 lb.
RICE—Yellow, $4·40 to $4·45; White, $5·20 to $5·25 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., August 12, 1910; Messrs. T. S. GARRAWAY & Co., August 16, 1910; Messrs. JAMES A. LYNCH & Co., August 8, 1910.

ARROWROOT—St. Vincent, $3·30 to $3·75 per 100 lb.
CACAO—$11·00 per 100 lb.
COCOA-NUTS—$18·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·00 per 100 lb., scarce.
HAY—$1·20 to $1·40 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·25 to $3·00 per 100 lb.
PEAS, SPLIT—$6·00 to $6·25 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $2·25 to $2·60 per 160 lb.
RICE—Ballam, no quotations; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, August 6, 1910; Messrs. SANDBACH, PARKER & Co., August 5, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·50 to $8·00 per 200 lb.	$7·50 to $8 00 per 200 lb., mkt. dull
BALATA Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c per lb.	10c. to 11c. per lb.
CASSAVA—	69c.	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$3·75 to $3·80 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$4·60	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		——
Madeira	2¼c. to 2½c.	2¼c. to 2½c.
PEAS—Split	$5·50 to $5·60 per bag (210 lb.)	$5·65 per bag (210 lb.)
Marseilles	wanted	No quotation
PLANTAINS—	20c. to 60c. per bunch	——
POTATOS—Nova Scotia	$2·50	$2·50
Lisbon		No quotation
POTATOS–Sweet, Barbados	$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00 to $5·50	$5·00 to $5·50
TANNIAS—	$1·92 per bag	——
YAMS—White	$3·00	——
Buck	$3·60	——
SUGAR—Dark crystals	$3·00 to $3·05	None
Yellow	$3·60 to $3·70	$3·70
White	$4·00 to $4·10	$4·00 to $4·25
Molasses	$2·25 to $2·50	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Purpose and Value of Agricultural Tours and Conferences.

IN articles that have appeared recently *, the continuous and extended nature of agricultural education has been emphasized. It is in agriculture, perhaps more than in any other pursuit, that the knowledge possessed by those whose function it is to direct or advise must increase continually, if their work is to maintain a reasonable standard of efficiency. This increase of knowledge is rendered all the more easy to obtain, because of the many opportunities that are afforded by the various problems that are always presenting themselves to the agriculturist for solution. It is evident that he is not in a position quickly to solve every one of these by his unaided effort. He seeks the help of those who are present to advise him, as well as that which is afforded by the experience of others.

One of the most modern means that have arisen for aiding the agriculturist is the Agricultural Tour. This, in its systematized form, was originally confined to those whose duties lay in an advisory capacity: officers of agricultural departments paid visits to countries other than those by which they were employed, in order that they may gain the knowledge of the experience of agriculturists in those countries, at first hand, and that they may enable those in their own land to benefit by that experience. This kind of travel continues to be of the greatest use, and its past success ensures its larger employment in the future. The scope of the agricultural tour has not been permitted, however, to remain circumscribed in this way. It has been extended, so that not only the agricultural adviser, but the planter or farmer himself, is being given increased opportunities to travel, for the purpose of enlarging his agricultural knowledge and experience.

An interesting description of an agricultural tour of this kind is contained in *Farmers' Bulletin*, No. 117, of the Transvaal Department of Agriculture, entitled An Agricultural Tour for South African Farmers. After mentioning some past agricultural tours that have been made, principally from Scotland, this publication gives details of one that was undertaken on

* *Agricultural News*, Vol. IX, Nos. 205 and 206.

the incentive of Lord Milner, then High Commissioner for South Africa, to whom it occurred that much of an educational value would be gained if some of the farmers of the Transvaal and Orange Free State could be given a chance of seeing the 'vastness and the richness of the agricultural resources of the other British Colonies'. A party of seven, consisting of delegates selected from the prisoners of war at St. Helena, placed in the charge of an officer of the Imperial Government, and including the wives of three of the members, was consequently sent on an agricultural tour through England, Canada, Australia and New Zealand, for the purpose of making a study and reports, in connexion with the different methods of agriculture and stock farming in those countries. The tour occupied nine months, and in that time, the party travelled about forty-two thousand miles. It was successful, to a certain extent, but its usefulness was diminished owing to the unsettled state of the country, the smallness of the party, and the fact that no lectures were given, or meetings held, on its return. The record of the journey was published, under the title of *Agriculture Within the Empire*, in both English and Dutch, and was widely circulated and favourably received.

The comparative success of this tour, even though it was not undertaken under the best circumstances, has led to the publication of the bulletin from which this information is taken, with the purpose of suggesting that another, larger delegation of South African farmers shall be made, for travel and report. The arrangements for this will be modified in accordance with past experience, which shows that large deputations are of more use for the purpose than small ones: that the time of travel should not extend for more than three or four months, as a large limit; that the course of making a thorough investigation of definite problems, at a few places, is preferable to that of hastening, merely in order to cover a large amount of ground; and that sufficient opportunities should be provided for the relation and consideration of facts in the knowledge of the members themselves.

The usefulness of visits to different agricultural centres, with a similar object, has been experienced already, in the West Indies, through the medium of the agricultural conferences that have been held in several islands. The meetings for the exchange of views, the visits for the purpose of observing various means and methods in connexion with agriculture, and the reports of delegates on their return from the conferences, as well as the accounts of the proceedings given in the publications of the Department, are all matters that pertain immediately to the agricultural tour; and although the conferences include less that is of the nature of travel, they afford more time for the immediate study of the problems that arise for consideration.

It will be well to consider some of the special advantages that are derived from the making of tours, and the holding of conferences, of an agricultural nature. They are particularly effective in the direction of broadening the views of agriculturists in regard to the subjects that interest them most nearly. This effect is assisted mainly by the opportunities that they afford of exchanging ideas and comparing the results of experience, and of viewing new machinery and methods pertaining to agriculture. The occurrence of the meetings that are held in connexion with them from time to time acts as a stimulant to interest in agricultural matters, so that this is prevented from dropping to a low level. Their chief value would appear, however, to be derived from the personal character of the work in connexion with them. Impressions are received and views are exchanged, directly, by individuals who personally inform others of what they have learned, so that there is a more lively interest in the subjects discussed, and the publications that deal with them are given an added usefulness.

The principle of affording agriculturists opportunities for individual contact with others who possess similar interests, under different conditions, is undergoing a merited extension. Its adoption, by making and holding agricultural tours and conferences, has already become a settled part of ordinary agricultural practice and administration, and the increased degree to which this is done only serves to emphasize its usefulness.

CYANOGENESIS IN PLANTS.

The term cyanogenesis has been suggested by Dunstan and Henry, to describe the production of prussic acid by plants.

The production of prussic acid by a plant was recorded for the first time in 1800, by a pharmacist named Bohm, of Berlin, who obtained it by distilling water which had been in contact with crushed bitter almonds. Though prussic acid was discovered by a Swedish chemist named Scheele in 1782, its poisonous nature was not recognized until 1803, when Schräder explained the toxicity of bitter almonds as being due to the production of prussic acid when the almonds are bruised in contact with water. Even before this time, instances of the poisonous nature of certain plants, which we now know to be due to their power of producing prussic acid, had been recorded; thus, in the *Libor Exoticorum* of Clusius, published at Leyden in 1605, reference is made to the poisonous nature of cassava, and the remarkable observation is recorded that the roots of this plant are more poisonous when

the plant is grown under the dry conditions prevailing in many parts of the mainland of South America, than when it is cultivated under the moist conditions of certain of the West Indian Islands. Again, Madden, in a paper communicated to the Royal Society of London in 1731, drew attention to the fact that cherry-laurel water, prepared by distilling water in which bruised cherry-laurel leaves had been macerated, was poisonous. The latter case was also explained by Schrader in 1803, as being due to the production of prussic acid. The cases of bitter almonds and cherry-laurel leaves remained until about 1851 practically the only known instances of the production of prussic acid by plants, but since that year the formation of this acid has been detected in a very large number of plants, and in an incomplete list of such plants recently compiled by Dr. Greshoff, of the Colonial Museum at Haarlem, about 150 species are enumerated. In most of these cases, investigators have been content to record the fact that prussic acid is produced, and the method of its production has been definitely ascertained in comparatively few instances.

In all the plants in which the chemistry of cyanogenesis has been thoroughly investigated, it has been found that the prussic acid is liberated when the plant is ground up, either in its fresh, moist condition, or if it has been previously dried, when the dried ground plant is placed in water: in every case the presence of water is essential. It has also been found that from all such plants, by appropriate methods, a definite crystalline compound can be isolated, which is quite stable, and can be kept for indefinite periods, but which when dissolved in water and boiled with dilute acids decomposes and evolves prussic acid. This same decomposition with the production of prussic acid, can also be brought about by various ferments. This may perhaps be conveniently illustrated by an example. By extracting bitter almonds with alcohol, a colourless crystalline substance can be obtained, which has been named amygdalin. When a solution of the latter in water is boiled with diluted hydrochloric acid (spirit of salt), the mixture acquires the well-known odour of essence of bitter almonds, owing to the fact that prussic acid and benzaldehyde (oil of bitter almonds) are simultaneously produced. The same decomposition is brought about if ordinary yeast is added to a solution of amygdalin in water. It may be assumed, therefore, that this crystalline substance, amygdalin, is the source of the prussic acid and the oil of bitter almonds, which are formed when ground bitter almonds are mixed with water. The agent contained in the bitter almonds which effects this natural decomposition of amygdalin has been found to be a special ferment. The latter, like amygdalin, can be isolated from bitter almonds, and is prepared and sold under the name emulsin. The proof that the production of prussic acid in the bitter almond is due to the decomposition of amygdalin by emulsin, is found in the fact that the addition of emulsin to amygdalin, dissolved in water, results in the almost immediate production of prussic acid and oil of bitter almonds.

Amygdalin belongs to a well-defined class of substances known to chemists as glucosides; the latter name indicating that when they are decomposed in the way already indicated by acids or ferments, they invariably yield glucose or a similar saccharine substance, in addition to certain more specific products such as the prussic acid and oil of bitter almonds produced in the case of amygdalin. These glucosides may be divided into two classes, according as they do or do not yield prussic acid on decomposition, and it is convenient to describe the former class as cyanogenetic glucosides. The fermentive agents which accompany these glucosides in plants, and which serve to decompose them, are termed enzymes or unorganized ferments, the latter name serving to distinguish them from the organized ferments such as yeast, mould, etc. Recent researches have shown that enzymes are widely distributed in plants and animals, and that many of the functions necessary to life are discharged by them. A general article on organized ferments and their industrial application has already been published in the *Bulletin* 1905, 3185, to which reference may be made for fuller information. (From the *Bulletin of the Imperial Institute*, Vol. IV, p. 329.)

THE FERTILIZING INFLUENCE OF SUNLIGHT.

On page 107 of the current volume of the *Agricultural News*, extracts were given from a letter in *Nature* of February 17, 1910, signed by A. Howard, Imperial Economic Botanist, India, in which it was pointed out that the custom of exposing the soil to direct sunlight for some time, which obtains in parts of India, for the purpose of increasing its fertility, may possibly have some connexion with the experiments of Russell and Hutchinson, which have shown that the partial sterilization of soil may have some effect in increasing its productiveness. These experiments were dealt with in the editorials of Nos. 202 and 203 of the *Agricultural News*, to which reference is made.

Following on the letter mentioned, several have been published subsequently in *Nature* which increase the interest of the subject. In the issue of that journal for March 3, 1910, E. J. Russell, one of the experimenters referred to above, supports the view that direct sunlight may have some sterilizing influence which increases the productivity of the soil, much in the same way as this is done by the action of heat and antiseptics. This is by reducing the numbers of the larger soil organisms which feed on the bacteria, so that the nitrogen-fixing organisms have the best chance to survive, with the result that they increase largely in numbers, and their effect in adding nitrogen is much greater than in unsterilized soil. Further, it is suggested that, as climatic difficulties interfere with the making of experiments in connexion with the subject, in England, a series of these should be conducted in India, where circumstances are more favourable.

Another letter, in the issue of *Nature* for March 10, 1910, makes reference to the increase of soil fertility that is generally evidenced where waste vegetable matter has been burned, and this is followed by another, in the issue of March 24, 1910, drawing attention to the larger crops that are obtained from soil into which steam has been injected for the purpose of destroying various pests.

Returning to the subject of the fertilizing influence of sunlight, *Nature* for April 7, 1910, contains a letter from F. Fletcher, of the Bombay Agricultural Department, which suggests that the effect of the sunlight in increasing productiveness is due to the destruction of some toxin contained in the soil. This supposition is dealt with in a letter in the issue of April 28, 1910, in which Russell refers again to the experiments that have been conducted by himself and Dr. Hutchinson, stating that this hypothsesis was the first examined by them, but that it was found insufficient to explain the phenomenon. He points out that, as the addition of a watery extract of untreated soil to soil that has been partially sterilized by toluene causes a further increase in fertility and bacterial activity, it is made difficult to maintain that ordinary soils contain toxic substances which reduce the number of the bacteria, and that the effects of sunlight or partial sterilization is to remove these.

FRUITS AND FRUIT TREES.

FRUIT IN JAMAICA.

The following is an extract taken from the *Annual Report on the Department of Agriculture*, Jamaica, for 1909-10, by the Director of Agriculture, Mr. H. H. Cousins, M A., which has just been issued. It is of special interest, as it deals with the growth and production of the chief fruit plants and fruits in Jamaica during the time covered by the report. A general review of the report will be given in the next number of the *Agricultural News*.

COFFEE. The floods in November did serious damage to large areas of coffee in the Blue Mountains, and some estates suffered severely. It would appear that coffee is rapidly ceasing to be an estate crop in Jamaica, and that the bulk of output is destined to be that of the small cultivators. There is no crop that can replace coffee as a money-earning crop in the drier upland districts of the island, and the Agricultural Instructors are well advised to encourage the people in these areas to pay more attention to their coffee. A combination of a milch cow, fed with cut grass, and a coffee patch manured thereby, has been shown to be most effective in improving and rendering most productive such cultivations.

Some cases of a coffee leaf-disease were brought to my notice during the year and found to be due to the fungus *Stilbum flavidum*, Cooke. [*Sphaerostilbe flavida*, Massee: also *Stilbella flavida*; see *Agricultural News*, Vol. VIII, pp. 292, 395 and 411.] Under normal conditions in Jamaica, this disease does not appear to be of a dangerous character, although in Costa Rica and other parts of Central America serious losses have been reported from the spread of this pest.

BANANAS. The appearance of the banana crop last October was exceptionally fine, and it was a great disappointment when the floods in November did such damage to the cultivations in the eastern half of the island. The drought that followed the storm also resulted in a set-back to the plantations on the south, and the western end of the island, so that there has been not only a shortage of spring fruit but a serious set-back in its quality.

Despite these troubles, the banana industry is progressing steadily in all parts of the island, and the time would appear but little distant when our exports will exceed 20 million stems per annum.

The development of the banana industry on the stiffer soils by bold drainage, and the production of profitable crops in dry districts by intensive culture and heavy mulches, are features of the recent progress that our planters have achieved.

Some recent experiments with manures have confirmed our former conclusions, that bananas do not require fertilizers, and that humus, lime and drainage are the chief factors that are of practical importance to the cultivator of this crop in Jamaica. If it be remembered that the drain on an acre of land, by the removal of 300 stem of bananas, is less than that of the crops, of wheat grown at Rothamsted for sixty years on the same soil without manure, it is not a matter for surprise that the banana should be so little responsive to chemical fertilizers.

The Jerusalem pea was tested at Hope as a green dressing, and the results were so promising that further trials of this leguminous plant are being made. Some planters report that it grows vigorously in the shade of a banana or cacao walk, and is a remarkable means of choking out weeds.

The dreaded banana disease is reported to be making alarming progress in the plantations of Costa Rica. From information received, it would appear to be a bacterial disease, although an eel worm at the root is also suspected. No remedial measures have as yet been discovered.

I am of opinion that the banana has been so weakened by forced vegetative growth and continuous asexual propagation under the conditions obtaining in Costa Rica that the plant has become unduly susceptible to the disease. I also believe that there would be little risk of this disease spreading in Jamaica owing to the greater hardiness of our plants, and the difference in the conditions of soil and climate. At the same time, it would only be prudent to prohibit all importations of banana suckers from foreign countries, lest the dreaded disease should gain a footing in this island

A 'scab' of bananas affecting a large acreage of fruit proved, on investigation, to be caused by the superficial feeding of grasshoppers on the young fruit. Owing to the drought, the grasshoppers were compelled to seek food, and attacked the bananas. The losses due to 'rejections' in this case were serious, but the circumstances were abnormal, and I do not regard this trouble as likely to be chronic.

No other remedy than that of hunting the grasshoppers, secreted in the young bunches of fruit, can be suggested for dealing with this pest. Since one grasshopper can destroy a bunch worth 2*s.* 6*d.*, it is obvious that energetic measures are fully justified.

CITRUS FRUITS. This industry remains in a depressed state, and it appears almost impossible to get a profitable outlet for our oranges except in the very early weeks of the season.

It was suggested during the session in Jamaica of the Royal Commission on Trade Relations between Canada and the West Indies, that a useful market for some of our citrus fruits might be found in Canada, under the favourable circumstances which the Royal Commission is seeking to bring about

Experiments on the gases given off by bananas and oranges, respectively, were carried out at the laboratory. It was shown that oranges gave off a good deal of carbonic acid gas when stored in a closed place, as in a ship's hold, but, on the other hand, carbonic acid was proved to be a wonderful preservative of bananas. It was shown, however, by direct trial, that the emanations from oranges stored in a chamber were found to have the effect of bringing about a premature ripening of bananas, if these gases were passed through a chamber laden with this fruit. The practical lesson indicated by these experiments is that separate storage is desirable for citrus fruits and bananas, when they are being transported for long distances by sea.

Open-sided boxes for the escape of orange gases and an effective cooling of the fruit in the cold chambers also appears to be a crucial matter which many orange shippers in Jamaica consistently ignore, with the result that their fruit arrives in a wasty condition, and financial losses accrue.

MANGOS. The article in the *Bulletin* on mangos for export has excited a good deal of interest in the Bombay variety, and we have had large orders for grafted plants. The Alphonso, imported by Colonel Griffith some eighteen years ago, fruited heavily at Elim in St. Elizabeth this year for the first time. The fruit was considered excellent. Our own tree of this variety has been severely root-pruned, but so far does not show signs of fruiting, and it would appear that this mango is not suitable for general planting in Jamaica.

We are extending our orchards, and a large number of trees have been budded during the year, chiefly to Bombay.

CACAO. This crop is now receiving serious attention in all parts of the island where it can be practically grown. The Agricultural Instructors are attaching due importance to the pruning and general sanitation of cacao trees, while the Department is sending out large numbers of plants raised from selected pods. The red Forastero cacao is in greatest demand among the large planters. The Criollo variety that was enthusiastically recommended by the Instructor for Hanover, a few years ago, has now been found a shy bearer, and some disappointment has resulted from the planting of this variety in that parish.

For endurance and reliability there is no cacao to beat the common calabash cacao of the peasantry, while the produce buyers pay the same price for all grades of beans in most districts where cacao is grown. I am, therefore, inclined to the opinion that it is not wise to lay stress on counsels of perfection as to cacao varieties for small cultivators, and that the outstanding matters of pruning and general sanitation call for the chief attention of our cultivators.

TRADE AND COMMERCE OF PORTO RICO, 1909.

The following extracts, showing the condition of the Trade and Commerce of Porto Rico, are taken from the *Diplomatic and Consular Reports, Annual Series*, No. 4433:—

COFFEE. The coffee crop showed a decreased yield of nearly 7,000,000 ℔., and steadily decreases every year, as the hope for a measure of protection for it in the United States, against the Brazilian production, becomes yearly less and less.

SUGAR. Although the export of sugar was the largest on record, there was a decrease in the planting area of 8,868 acres, and in value, of £55,840. This is accounted for by the drought in the south of the island.

TOBACCO. Tobacco, too, decreased in acreage more than 1,000 acres, but the total value of all products exported showed an increase of £48,528.

The total number of cigars manufactured was 227,021,365, and in addition, 365,525,563 cigarettes.

Practically all these latter were for home use, as also were 84,933,265 of the cigars made.

COTTON. During the year, a decrease was shown, although it should have been the contrary, as 25 per cent. more acreage was planted than in the previous year (1908).

The heavy rains of September, October and November are accountable for the falling-off.

ORANGES The bulk of oranges exported still consists of so-called 'wild oranges', which, however, are not so, but are thus called to distinguish them from those under cultivation since citrus fruit-growing was started some eight years ago.

It is impossible to obtain anything except the bulk record of this industry, but from the export returns, showing a decreased value of £47,708 during the year, and that prices were fairly good, it is to be inferred that the year's result was not satisfactory.

PINE-APPLES. The pine-apple acreage is increasing enormously. More than double the amount of fruit was exported than in 1908, while the output of the canned fruit increased 25 per cent.

SISAL. A quantity of sisal plants, bought by the Government, were planted upon public land in the vicinity of Yauco, by way of experiment, which, when sufficiently advanced, will be submitted to expert treatment, with the view of pronouncing upon the possibilities for a market.

The Manchurian Soy Bean Industry.—A note in the current volume of the *Agricultural News*, page 188, dealing with a report by H.M. Consul at Newchwang on the soy bean industry of Manchuria, drew attention to the fact that several shipments of soy bean cake to Europe had resulted in failure. More recent reports (*Board of Trade Journal*, July 7, 1910, p. 40; July 21, 1910, p. 145) show that, shipments of the soy bean to Europe, on the contrary, are increasing, in spite of initial difficulties, the amount being 60,000 tons in 1909, as against 11,000 in 1908. In the past season, the quantities of beans and bean cake shipped to Europe, from Vladivostock up to April 9, and from Dairen up to March 29, were 120,064 tons and 229,430 tons, respectively. In 1908-9, the total export to Europe from these ports was 410,000 tons, all of which went to the United Kingdom, except 5,000 or 6,000 tons.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 15, with reference to the sales of West Indian Sea Island cotton :—

Only a small business has been done in West Indian Sea Island since our last report, and prices are without change.

The sales include Nevis 19*d.* to 20*d.*, and St. Croix and Barbados at 20*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 6, is as follows:—

Since our last report, of July 2, the market has continued dull, with no demand for the 53 bales stock, consisting of planters' crops, held at 50c. to 55c. The 100 bales on plantations around Beaufort are still on hand.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the exports of cotton from the West Indies for the quarter ending June 30, 1910 :—

Origin.	Number of bales.	Weight, lb.	Estimated value. £	s.	d.
Antigua	72	16,128	1,209	12	0
Barbados	248	124,066	7,754	2	6
Grenada	1,062	319,680	14,014	0	0
Montserrat	96	36,370	2,727	15	0
St. Kitts	62	24,753	1,856	9	6
Nevis	110	26,759	2,006	18	6
Anguilla	44	8,800	660	0	0
St. Vincent	295	95,400	6,611	3	6
Trinidad Tobago	9	4,500	(none given)		
Virgin Islands	55	11,910	677	3	0
St. Lucia	9	1,770	132	15	0
Total	2,062	670,136	37,649	19	0

All this cotton was sent to the United Kingdom, with the exception of 8 bales (4,137 lb.), of an estimated value of £258 11*s.* 3*d.*, which was shipped to the United States from Barbados. With the exception of 1,151 bales (348,386 lb.), of an estimated value of £14,992 14*s.* 4*d.* (excluding Trinidad), of Marie Galante, all the cotton shipped was Sea Island.

The amount and value of cotton exported from the West Indies during the two preceding quarters of the season were:—

Oct. to Dec., 1909	342,257 lb.,	value	£21,236 13*s.* 1*d.*
Jan. to Mar., 1910	1,127,142 lb.,	,,	£70,788 0*s.* 5*d.*
Total	1,469,399 lb.	,,	£92,024 13*s.* 6*d.*

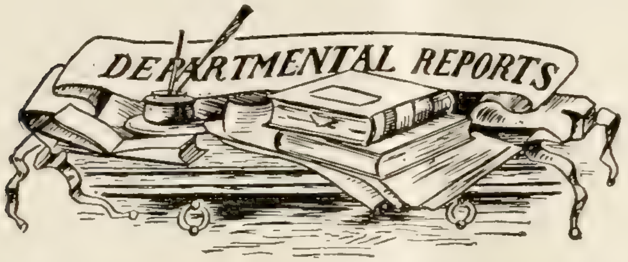
Thus the total amount of cotton exported, so far, during the present season is 1,469,399 lb. (3,817⅛ bales), of an estimated value of £92,024 13*s.* 6*d.*, and 670,136 lb. (2,062 bales), of an estimated value at £37,649 19*s*, making a total of 2,139,535 lb. (5,879⅛ bales), of an estimated value of £129,674 12*s.* 6*d.*

WEST INDIAN COTTON PRICES, 1909-10.

The following list of outside prices for West Indian Sea Island cotton, obtained in England during the current crop season, is taken from Messrs. Wolstenholme and Holland's fortnightly cotton reports, and is published here for purposes of reference :—

	Date.	Price, pence.
1909		
	October 11	11½ to 15½
	November 8	16 to 17½
	November 22	17½
	December 10	16½ to 17½
	December 20	18 to 19
1910		
	January 3	18½ to 19
	January 17	18½ to 20
	January 31	18 to 21
	February 14	17¼ to 20
	February 28	18 to 20
	March 14	17 to 23½
	March 24	18 to 26
	April 11	18 to 27
	April 25	17 to 23
	May 9	18 to 22½
	May 23	22
	June 6	20 to 21½
	June 20	20 to 24
	July 1	21 to 26
	July 18	20 to 24
	July 28	19 to 21
	August 15	19 to 20

Outside prices for Stains, 7½*d* to 17*d*.



PROGRESS REPORT ON THE EXPERIMENTAL AGRICULTURAL WORK OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE, BRITISH GUIANA, APRIL 1908 TO OCTOBER 1909.

The work described in this report was undertaken, under the auspices of the Department of Science and Agriculture, British Guiana, at the Botanic Garden, the Onderneeming School Farm, the Issorora Rubber Farm (under the general supervision of the Government Agent of the North Western District), the rubber and forestry station at Pln. Christianburg, Demerara River, and at the Rubber Experiment Station at Bonasika Reserve. Plans for the establishment of an experiment station near Marlborough, Pomeroon River, are being considered by the Government.

In the work in raising canes from seed, much trouble was experienced at one time through damping off during the heavy rains; a remedy was found in thoroughly watering the soil in the seed boxes with a mixture of nitric acid with water, containing 2 oz. of the acid in 1 gallon of water, the soil being treated subsequently with water alone in order to remove excessive acidity. In January and February 1909, about 55,000 cuttings of the more valuable seedling canes were distributed to a few planters. Other promising varieties were planted out for manurial variety experiments, and these are intended to be used, partly, for making comparison of the value of calcium cyanamide and calcium nitrate, as manures, with that of the older nitrogenous manures. The experiments connected with cane-arrowing and seed-sowing, in 1908, showed that the seeds of arrows from the Bourbon variety were the most fertile, followed in order by D.109, D.145, D.4805, D.147, D.2468 and B.208.

The manurial experiments with nitrogenous manures, in connexion with sugar-cane, showed that when nitrate of soda follows sulphate of ammonia, the latter having been used for some time on unlimed land, a reduction of the increased yield that had been obtained already was experienced. When the positions were reversed—sulphate of ammonia following nitrate of soda—an increased yield was obtained. Similar results were gained on limed land. The following conclusion from these trials is made: The results clearly indicate that on very heavy clay soil, such as that of the Experimental Field, and under tropical meteorological conditions, the deflocculation or puddling caused by long-continued dressings of nitrate of soda is likely to prove more injurious to the soil than is the souring action of sulphate of ammonia. The trials with phosphates are not yet complete, on account of the numerous comparisons that are required in order to obtain a definite result. Increases of yield are still usually obtained from an application of lime, to certain plots, in 1891, but there are indications that the effects of the liming are almost exhausted.

As a result of the trials of the new varieties of sugar-cane, information has been obtained as to the general influence of the female parent on the crop and sugar yields. These are stated to have no relation to the female ancestry of the cane. Other interesting results in connexion with the manurial trials of all the varieties are: that readily available nitrogen has the most potent effect on the yields; that nitrate of soda has not been as satisfactory as a manure, as sulphate of ammonia; that D.1082, D.1119 and D.790 were the best plants, and D.45, D.1082 and D.755 were the best first ratoons under the conditions in the Brickdam Field and the North-West Field, respectively. As before, B.208 has shown a preference for the lighter soils, while its juice was, as usual, notably high in sucrose and purity. Tests of a larger number of the newer varieties, in the experimental fields, indicated that several of these may become of considerable value

Trials with nitro-bacterine specially prepared for use in connexion with the cultivation of sugar-cane, whether in plots or pots, showed that no effects were produced by the use of this preparation.

The continuation of investigations into the composition of the soil and subsoil waters of the experimental fields confirmed the results obtained formerly, namely, that in the wet season, a great increase in ammoniacal, and a decrease in nitric, nitrogen takes place, the comparison being made with the amounts of these present in the dry season. An experiment to find the composition of water taken at a depth of 12 feet below the surface of the soil showed, particularly, that the proportion of nitrogen present in it, in the form of ammonia and organic matter, was high when compared with that present as nitrates. It was decided to make an investigation for the purpose of finding a probable cause of the low fertility of the land from which the samples for these experiments were taken, and the result was to indicate that this lower fertility was probably due to the extent to which magnesium salts are present, in comparison with the content of calcium salts.

Information relating to the quantities of salts, etc., contained in the lower layer of the soil, and in the subsoil, indicates unmistakably the relatively large extent to which soluble salts useless to plants, and some even poisonous to them, are present in these, in the experimental fields. An enquiry into the evaporation of the soil water in air, and in carbon dioxide, is of some interest. It shows that the presence of the latter, to its proper extent, in the soil, modifies the poisonous action of the magnesium salts present in the soil water, and indicates the great importance of the maintenance of the supply of humus in tropical soils.

Among the results obtained in the rice experiments are the following: (1) that applications of sulphate of potash and lime during 1908 gave increases of yield; (2) that it is necessary to use pure seed paddy if the maximum crop of any one kind of rice is to be obtained; (3) that on soils such as those of the Experimental Field, though as yet no advantage of single planting over multiple planting has been indicated, the number of plants in a bunch may be reduced to about two or three without lessening the chances of obtaining a maximum crop. As regards cotton, accounts of trials with different varieties, and a report on several indigenous cottons, are given, and it is stated that Caravonica silk cotton has shown itself unworthy of adoption for cultivation in British Guiana.

The report concludes with particulars of interesting experiments with bananas, cacao, coffee, limes and other fruits, miscellaneous products and rubber, the enumeration of which the space at disposal does not permit.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In the present number, the editorial deals with The Purpose and Value of Agricultural Tours and Conferences, and useful facts are quoted from South African experience in connexion with the former of these.

An article given on page 274 presents a general account of cyanogenesis in plants.

Recent evidence as to the possible fertilizing influence of sunlight is collected on page 275.

The state of fruit and fruit-growing in Jamaica is described on page 276, in matter reproduced from a recent report by the Agricultural Department of that colony.

The Insect Notes, on page 282, give a general account of Insecticides.

A summary of recent investigation in connexion with legume inoculation appears on page 283.

On pages 286 and 287, the Fungus Notes deal with two interesting fungi that are described from St. Lucia.

Calcium Cyanamide and Nitrate of Lime.

Several notes under the above heading have appeared from time to time in the current volume of the *Agricultural News* (see pp. 169, 185, 217 and 249). These have reviewed experiments undertaken in different parts of the world for the purpose of comparing the manurial value of calcium cyanamide and nitrate of lime with that of nitrate of soda or sulphate of ammonia. Reference to these notes will show that the general result of such investigations has been to indicate that the two first-mentioned manures possess a very similar manurial value to that of the others.

This conclusion is supported by experiments which are described in the *Report on Field and Pot Culture Experiments*, 1909, of the Woburn Experimental Station of the Royal Agricultural Society of England. It is stated in this report that it is evident, in the case of those experiments from which conclusions were drawn, that there is little to choose between the four materials —calcium cyanamide, nitrate of lime, nitrate of soda and sulphate of ammonia—so far as the efficacy of the nitrogen contained in them, respectively, is concerned. The evidence from the trials shows that the differences in action of these manures do not always tend in the same direction; nor are they sufficiently regular to indicate that one manure may be preferred to the others, provided that the nitrogen in each costs approximately the same amount per unit. It is pointed out that this circumstance makes it interesting as to what the prices of these manures will be in the future.

The Camphor Trade of North Formosa, 1909.

The shipments of camphor (which is a Government monopoly) from North Formosa, during 1909, are given in the *Diplomatic and Consular Reports*, No. 4500, Annual Series, as 6,670,660 lb. The profits from the monopoly were small, on account of the lowering of the price of camphor in order to drive Foochow and synthetic camphor from the market.

According to the same authority, 4,795,907 lb. of camphor oil was produced; all this was shipped to Japan to be manufactured into camphor, of which a yield of about 40 per cent. is obtained.

Large tracts of forest abounding in camphor trees will be opened for collecting during the next few years. A gradual reduction of the supply of trees in the settled districts is taking place, but compensation for this is being obtained by making plantations where the conditions are suitable. Experiments are being continued in connexion with the production of camphor from leaves by distillation, but the investigations have not, so far, led to anything being attempted in this matter, on a large scale.

The statement has been made that the Government Monopoly Bureau has restricted the output of camphor and camphor oil for 1910 to 6,670,000 lb., and 7,330,000 lb., respectively. The demand for camphor from Formosa is likely to become greater, on account of the recent establishment of two celluloid factories in Japan.

'Earwigs' Attacking Cotton.

Specimens of 'earwigs' (Forficulidae) have been received recently at the Head Office of the Department, from Mr. W. N. Sands, Agricultural Superintendent of St. Vincent, with the statement that these insects were causing a certain amount of damage to young cotton in that island. The harm was brought about by their eating the young sprouts, under the ground, as soon as the seed had germinated.

Information has been received subsequently from Mr. W. H. Patterson, Acting Agricultural Superintendent, St. Vincent, to the effect that the pest appears to have been controlled, as it was extremely difficult, recently, to find a single specimen.

The methods employed in this control were to light fires at night in the fields where the insects were present to a dangerous degree, and to poison them by means of cotton seed dressed with Paris green. In the latter case, the poisoned cotton seed was sown in holes on one side of the bank, while the ordinary seed put in for the crop was planted higher on the same bank.

The Distribution of Cotton Grown in the United States.

The United States Census Bureau has recently issued a special bulletin on the supply and distribution of cotton grown in that country. An abstract of this, contained in the *Journal of the Royal Society of Arts* for July 8, 1910, states that the information included in the bulletin shows that only about one-third of the cotton grown in the United States is manufactured in that country; the value of this cotton in 1905, when made into cotton goods, was £9,000,000. The part of the raw material used by the European manufacturers is employed in the production of goods that are, for the greater part, of a finer quality than those manufactured in the United States; the value of the goods made from the average American crop is estimated at £400,000,000.

The report states that, whereas during the year ended June 30, 1909, manufactured cotton goods to the value only of £6,300,000 were shipped from the United States, the imports of such goods reached approximately £12,500,000 in value. It is pointed out, however, in the journal to which reference is made above, that the annual exports of manufactured cotton goods from the United States vary greatly from year to year, and that the falling off in them between 1906 and 1909 is due to a lessening in the shipments to China, which were of the value of £6,000,000 in 1906, and £1,600,000 in 1909.

The abstract goes on to show that the prospects of the American cotton crop are reported to be not as favourable as those in the last few years, as the United States Department of Agriculture has announced that there has been a small deterioration of the plant during the month of June, but that there is no need for much anxiety at present.

Cloth from Banana Fibre.

An account is contained in the *Board of Trade Journal* for July 28, 1910, of an exhibit of banana cloth that was made at a recent fair in China. It appears from this that the fibre is manufactured from banana stalks by the following process. The stalks at the age of about one year are unrolled and steamed over water, until they become soft; after this has been done, the outer skin is removed by means of a scraper, in which the strips are passed between two blunt blades. The parts left after the outer skin has been removed is enclosed in a cloth and partly dried by being pounded. After this, the fibre is shredded and twisted into thread which is then weaved

The process is only in the experimental stage at present, so that the price of the cloth is high, £1 3*s*. 6*d*. being asked for a roll 5 yards long and 1 yard wide. The claim is made that the cloth shows very good lasting qualities, and there is a possibility that its manufacture on a larger scale will lower the price, so that the product may be enabled to compete with others for summer wear.

Tephrosia Purpurea for Keeping down Weeds.

A translation of part of an article which appeared in *L'Agronomie Tropicale* for September, 1909, dealing with the suitability of *Tephrosia purpurea* for the purpose of keeping down weeds in rubber and coffee cultivations, was given in the *Agricultural News*, Vol. VIII, p. 405. In relation to the use of the plant for this purpose, an extract from an article which appeared recently in the *Agricultural Bulletin of the Straits and Federated Malay States*, is given in the *Planters' Chronicle* for June 18, 1910.

The article states that experiments have been conducted for some time for the purpose of finding a plant which would keep weeds out of rubber plantations, and at the same time do no harm to the trees. The investigations showed that *Tephrosia purpurea* was admirably adapted for the purpose. The seed which had been presented by Dr. Treub, of Buitenzorg, was planted in two plots. In the first, one or two seeds were sown to every square foot; in the second, two seeds were put in, every few feet, along ridges on either side of the rubber trees.

In both cases, the Tephrosia has completely kept down all weeds and, in the second instance, now forms two solid hedges through which nothing passes. The method of growing the plant in hedges appears to have advantages in that a better air circulation is produced around the roots, and inspection of the plantations is conducted more easily. Circling the trees with Tephrosia also has its advantages, especially in the matter of sowing the plant.

Accounts were kept in order to afford a means of effecting a comparison between the cost of clean weeding and of the establishment of Tephrosia. These showed that, over a period of five years, the latter was about one third of the former.

INSECT NOTES.

INSECTICIDES.

During the past few years there has been a great increase in the amount of materials used in the West Indies for the control of insect pests. This has been partly due to a better knowledge of the means of controlling pests which were formerly known, and partly to the revival of the cotton industry, which has brought to notice several not previously recognized.

The proper use of insecticides depends upon a knowledge of the life-history and structure of the insects to be dealt with. Insects which have mouth parts suited for biting, may be controlled by means of stomach poisons, which being eaten with the food, cause the death of the insect by their poisonous action. Many soft-bodied insects, on the other hand, and especially insects which have mouth parts fitted for piercing the plant tissues and sucking the juices from them, may best be destroyed by the use of poisons which kill by coming into contact with the surface of the body.

Insects which bore into the tissues of plants or live amongst seeds, grain, flour and similar materials may sometimes be destroyed by the use of a fumigant, so applied that the poisonous fumes or gas will be able to reach the insects and act upon them. In addition to these substances, which actually kill the insects, there may also be considered those which are useful from their action of repelling the insects. Mosquitos, borers, and many household pests may be dealt with by this means.

In considering the different kinds of poisons, it may be well to note in a general way the insects for the control of which each kind is useful.

STOMACH POISONS. These may be used against all kinds of leaf-feeding caterpillars, cut worms, mole crickets, cockroaches, grasshoppers, ants and white ants. For the control of caterpillars, a suitable poison may be dusted or sprayed on the surface of the leaves. Cut worms may be killed by mixing the poison with an attractive food substance and placing it where they will find it. The same method applies to mole crickets, cockroaches, grasshoppers, etc.

The most important stomach poisons available for insecticide purposes are those which contain arsenic in one form or another. The best known of the arsenical poisons in the West Indies is Paris green, which has been used to such a large extent in the control of the cotton worm. Other arsenical poisons are London purple, arsenate of lead, arsenite of lime and white arsenic. Corrosive sublimate, which is a compound of mercury and chlorine, is a very powerful stomach poison; but it is not adapted to general agricultural use because of its injurious effect on tender plant tissues; it is the poisonous part of the solution used for the preservation of books against the attacks of insects. (See *Agricultural News*, Vols. I, p. 140; II, p. 42; VI, p. 346; VIII, p. 367.) Boracic acid may be counted a stomach poison, since it produces death when eaten by cockroaches; and plaster of Paris may also be considered under this head, for it may be mixed with flour in such a way as to be attractive to cockroaches and cause their death, when, under the influence of moisture, it hardens in the digestive tract of the insect.

Paris green is sold in the form of a very fine powder, which is a compound containing arsenic, copper and acetic acid. It was originally manufactured as a colour, but is now made on a large scale for insecticide purposes. Paris green may be used dry, or as a spray. It is used dry in varying proportions, mixed with air-slaked lime, flour or other substances; or by itself. When used as a spray, it is generally employed at the rate of 1 ℔. to 150 gallons of water. This proportion may be varied to make the mixture either stronger or weaker, according to the plants to be sprayed. Paris green in water sometimes has a burning effect on the leaves of plants, and to offset this, quicklime should be added to the mixture at the rate of about 2 ℔. of lime to each pound of Paris green.

London purple is similar in its effect to Paris green, and may be used in the same manner. The proportion of arsenic, in London purple, is rather smaller than that in Paris green, and consequently more of the poison would be required. Used as a spray, London purple will need to be treated in exactly the same way as Paris green. Arsenate of lead is generally sold in the form of a heavy paste, which is only available for use as a spray. It is rather slower in its action than Paris green or London purple, but does not burn the foliage, even of delicate plants, and on this account it may safely be used even at strengths of 10 to 20 ℔. per 100 gallons of water. Within the past few years, arsenate of lead has been placed on the market in the form of a powder, which may be applied dry, as a dust.

Arsenite of lime and white arsenic are more likely to burn the leaves of plants than any of the other arsenical poisons mentioned, and consequently have a somewhat limited use. They may be employed in the destruction of cut worms, ants, grasshoppers and termites, in the form of a bait in which the poison is mixed with some attractive food substance.

Corrosive sublimate, used as book poison, is prepared by mixing 1 oz. of this material with 1 oz. of carbolic acid in 2 parts of methylated spirit. The corrosive sublimate enters into solution, and when the mixture is applied to the surface of books, especially those in cloth bindings, it gives very good protection against the attacks of cockroaches and similar pests.

Boracic acid is used as an insecticide mixed with equal parts by weight of sweet chocolate, molasses or some similar substance, for the destruction of cockroaches. This mixture is not poisonous to cats, dogs and fowls; but is a very efficient remedy for cockroaches. Plaster of Paris mixed with flour will also be eaten by cockroaches if placed in their haunts and, if water is available for the insects to drink, proves a very good insecticide. The plaster of Paris, moistened by water, hardens in the digestive tracts of the insects, and in this manner kills them, as has been explained.

CONTACT POISONS. These are found useful for the control of scale insects, plant lice, cotton stainers and mosquito larvae. In the case of the first three of these, it is necessary that the insecticide should come directly into contact with the bodies of the insects. In the case of mosquito larvae, for instance, when kerosene is applied to the surface of the water in which they live, the insects are killed by absorbing the poison, as well as by suffocation.

Contact poisons usually depend for their insecticidal properties on the action of the soap, oil or rosin which is contained in them. Recently, spray mixtures containing lime, salt or sulphur, or some form of arsenic have also been used. Kerosene emulsion, whale oil soap and rosin compound are well-known examples of contact poisons which have been used in the West Indies with good results. The directions for preparing them for use may be found in various publications of the Imperial Department of Agriculture*. The lime, salt and sulphur mixtures are more especially suitable for use in

*See. *Scale Insects of the Lesser Antilles*, Pamphlet series Nos. 14 and 22.

temperate climates, where they may be applied during the season when the trees are dormant, since insecticides of this class very often cause a considerable amount of injury by burning the foliage. Contact poisons containing arsenic are more especially useful in sprays and ips dfor the control of ticks on cattle and other animals.

FUMIGANTS. The most important of the insecticides which may be applied in the form of a gas are carbon bisulphide, hydrocyanic acid and sulphur dioxide. Carbon bisulphide is specially suited for use against insects infecting seeds, grain, flour and all kinds of stored household vegetable products. It is also useful against ants and other underground insects. Carbon bisulphide is a volatile, inflammable liquid, the vapour being considerably heavier than air, and it is used by being introduced into an enclosed space. A general account of the use of this material appeared in a recent number of the *West Indian Bulletin*, and of the *Agricultural News*.

Hydrocyanic acid gas is produced by the action of sulphuric acid on potassium cyanide; it is a colourless, very poisonous gas, which is especially suited for the destruction of scale insects on growing trees, nursery stock, etc. It can only be used, however, in an enclosure, and when it is applied for the destruction of scale insects on orchard trees, some form of tent must be employed to retain the gas in contact with the tree. For the fumigation of nursery stock, it is employed in air-tight boxes or compartments. It is also very useful for the fumigation of dwelling houses, mills, storehouses, etc., in the same way as carbon bisulphide is used.

Sulphur dioxide (fumes of burning sulphur) is very useful, also, for fumigation in buildings and holds of ships and in similar cases; it has an advantage over hydrocyanic acid gas in its greater penetrating power, when used in connexion with such substances as cotton seed.

REPELLENTS. Various substances are used for the purpose of preventing insect attacks, because of their disagreeable taste or odour. Carbolic acid, creosote and similar preparations are the most common of these. Timber used for building purposes, which has been treated with coal tar, creosote, etc., is not readily attacked by wood ants (termites); and tree borers may often be deterred from entering the trunks of trees by covering them with a mixture of lime, or lime and clay, to which carbolic acid or creosote has been added. Citronella and other aromatic oils may be used to repel the attacks of mosquitos; naphthalene, camphor, lavender and similar materials are employed to prevent the infestation of woollen fabrics, furs, feathers, etc., by clothes-moths, beetles and silverfish. In a similar manner, these substances repel attacks of flesh flies, when mixed with dressings used for treating wounds on cattle, horses and other domestic animals.

EXPERIMENTS IN LEGUME INOCULATION.

In the following article, a review is made of experiments that have been undertaken, in different parts of the world, with a view to ascertaining the effect of the application of bacterial cultures for the purpose of increasing the yields of leguminous plants. The trials were chiefly made with the preparation known as Nitro-Bacterine.

An abstract of a paper given in the *Experiment Station Record* of the United States Department of Agriculture, for April 1910, shows that bacteriological examinations and pot tests with lupines, conducted at the Stockholm Experiment Station with nitro-bacterine, indicated that this did not contain *Bacillus radicicola*—the organism that gives rise to nodules on the roots of legumious plants and enables tehm to make use of the nitrogen of the air—and that no nodules were produced on the roots. It is recommended that soil which is known to contain the required organisms should be used preferably to either nitragin or nitro-bacterine An abstract of another paper, on the next page of the same publication, dealing with experiments conducted in Germany, shows that both of these inoculating materials caused an increase in connexion with white lupines and sand peas on calcareous sandy soil, especially where potash and phosphates had been applied, the nitro-bacterine being more effective than the nitragin; the action of the latter was especially feeble on sandy soils deficient in lime.

A letter in the *Southern Planter* for June 1910, from the Director of the Virginia Agricultural Experiment Station, recommends the use of inoculated soil from a field where legumes of the same kind as those to be grown have been raised, wherever it is possible to do this. The statement is further made that the artificial cultures of legume bacteria are a poor, but sometimes useful, substitute for soil of the kind described; but that it is probable that the methods of preparing artificial cultures will be perfected, so that their use shall be preferable to that of soil, though this is not the case at the present time.

The *Report on Field and Pot Culture Experiments*, 1909, of the Woburn Experimental Station of the Royal Agricultural Society of England, contains information which indicates that field experiments in which soil that had been treated with nitro-bacterine was spread upon the halves of individual plots in which inoculated seed had been sown in the previous season, showed that the inoculation either of the seed or of the added soil had not been beneficial in any way, except that there was a small increase in yield in the case of Dutch white clover. Pot experiments conducted in the same connexion showed a slight increase in most cases where inoculation had taken place, but this was too small to allow of any clear deductions being drawn, especially in view of the negative results obtained in the experiments just described.

In the *Tropical Agriculturist* for June 1910, an article by T. Petch, B.A., B.Sc., Mycologist to the Ceylon Department of Agriculture, contains the following statement: Nitro-bacterine has been tested for two successive years at each of two agricultural stations in Germany. In addition to the the usual inoculations and crop tests, a bacteriological analysis of the mixture has been made at the same time by competent bacteriologists, accustomed to isolating and identifying nodule-forming bacteria. The result of the analysis has been the same in all cases, viz., that nitro-bacterine does not contain any nodule-forming bacteria. Similar work has been done in Italy, with exactly the same result. Nitro-bacterine, therefore, falls into the same category as Moore's cultures of nodule-forming bacteria. The latter were dried on cotton-wool, and distributed by the United States Department of Agriculture many years ago, but the distribution was abandoned, because it was impossible to preserve the bacteria in that way, and therefore the cultures were valueless. When nodule-forming bacteria are dried they die, and for that reason nitro-bacterine cannot contain any.

These results, and other considerations, would appear to show that the preparation of cultures for inoculating soil with legume bacteria has not reached a stage at which dependence may be placed on such cultures, for this purpose.

GLEANINGS.

It is of interest that several extracts from the *Agricultural News* have been published in the form of a supplement to the *Uganda Official Gazette*, the issue being that of July 1, 1910.

The report of the Agricultural Instructor, St. Vincent, for July 1910, shows that the general prospects for cotton-growing are favourable, and that success continues to be obtained in the matter of implemental tillage.

Information has been received that, for the last sugar crop, the Antigua Sugar Factory at Gunthorpes dealt with 48,319 tons of cane, from which 5,400 tons of sugar was made, giving an average of 8·95 tons of cane per ton of sugar made.

A statement in the *India Rubber Journal* for July 25, 1910, shows that the forthcoming International Rubber Exhibition (see *Agricultural News*, Vol. IX, pp. 60, 156, 172 and 220) will be held from June 24 to July 11, 1911, instead of from June 12 to June 28, 1911.

The *Leeward Islands Gazette* for August 4, 1910, contains an Order in Council, employing schedule B of Montserrat Ordinance, No. 2, 1906, by which it is determined by the Governor that the insecticide Abol shall be exempt from the payment of import duty into Montserrat.

The *Sugar Beet* for July 1910, publishes figures by Otto Licht, the well-known authority, which show that the consumption of sugar per head during 1908-9 was greatest in England, Denmark and the United States, the amounts being 41·13, 35·54 and 32·26 kilos., respectively.

Information contained in the report of the Agricultural Instructor, Nevis, for last July, shows that the drought in that island was still continuing, and that the cane and cotton crops were likely to be very short. The rainfall at the station for the month was 2·80 inches, and the average for six estates was 2·07 inches.

In *Tropical Life* for July 1910, p. 139, reference is made to a paper on the budding of cacao by T. J. Harris, published by the Jamaica Board of Agriculture in 1904. In this, it was shown that cacao can be budded by employing a bud with a square piece of bark, about 2 inches × $\frac{3}{4}$-inch thick, attached to it, which is applied, with the usual precautions, to the stem of a cacao tree from which a piece of bark, of similar size has been removed. This is analogous to the method known as the Patch Budding of Mangos (see *Agricultural News*, Vol. VIII, p. 70).

An announcement in the *Grenada Government Gazette* for August 3, 1910, states that advertisements for insertion in the *Grenada Handbook* for 1911 will be received at the Colonial Secretary's Office until Friday, September 30. The rates for advertisement, payable at the Treasury in advance, are 10*s.* for a whole page and 7*s.* 6*d.* for half a page.

The total deliveries of Cuban sugar, to July 1, 1910, were 1,689,675 tons, as compared with about 1,400,000 tons for the previous similar period. Of the 1,305,600 tons exported from Cuba up to July 1, 1,100,000 tons went to New York, Philadelphia and Boston, 118,000 tons to New Orleans, about 8,000 tons to Canada and 120,000 tons to England. (The *Louisiana Planter*, July 23, 1910.)

An announcement has been received of the Tenth International Geographical Congress to be held at Rome on October 15 to 22, 1911, under the patronage of His Majesty the King of Italy. This shows that membership of the Congress can be obtained by sending £1 to Avv. Felice Cardon, Treasurer of the Organizing Committee, 102, Via del Plebiscito, Rome. Persons may become Aggregated Members on payment of half of the above fee.

According to *Nature* for June 23, 1910, the Earl of Crewe, Secretary of State for the Colonies, has appointed a Committee composed of representatives of the Colonial Office and of the Natural History Branch of the British Museum, to consider the protection of plumage birds. The main purpose is to find means of preventing the indiscriminate slaughter of such birds that is taking place in certain parts of the Empire, as well as to obtain the co-operation of all the countries included in it, toward this end.

Diplomatic and Consular Reports, No. 4448, Annual Series, deals with the trade and Commerce of the Canary Islands during 1909. This gives a rough estimate of the whole trade of the islands, stating that the exports may be valued at £1,200,000, of which amount about £1,000,000 is made up from fruit and vegetables. The quantity of bananas shipped during the year showed an increase on that for the previous year, being 2,782,299 crates. The competition of buyers made prices favourable to the growers of this fruit.

An account of the recent tour of the Demerara Banana Commission, given in the *Demerara Daily Chronicle Mail Edition* for July 8, 1910, after an interview with Professor Harrison, mentions the variety of banana called the Congo banana, which is stated to be immune from the disease which attacks the Gros Michel. It is stated in the same issue that the Commission has instructed the delegates, Professor Harrison, Mr. F. A. Stockdale, and Mr. Wood Davis, to draw up a report giving the results of their enquiries in Surinam, and embodying the views of the Commission.

A book published recently, under the title of *Die Tone*, gives an account of experiments undertaken by the author, in Austria, for the purpose of determining the cause of the plastic properties of clay. According to the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXII, No. 8, p. 712, the investigations which are described in the book have shown that the treatment of clay with water brings about the formation of colloid substances, and it is the presence of these in the clay that makes it exhibit the property usually known as plasticity.

STUDENTS' CORNER.

SEPTEMBER.

First Period.

Seasonal Notes.

At the present time, the land is in preparation for the planting of sugar-cane in December, and much information that is of use and interest will be available concerning methods of tillage and manuring for this crop. In Barbados for sugar-cane growing, the land is usually either close-subsoiled, or the upper part of the soil, only, is turned over by means of a mould-board plough. For planting the cane, the holes vary in depth: sometimes a shallow hole and then a stock hole are dug. Methods differing much in detail are employed in the various sugar-producing islands. Take notice of as many of these as you can, and see how far their adoption, in any given instance, is correlated with the conditions of the soil. Chemical manures will have been applied to the young canes, and opportunities will have occurred for noticing the comparatively quick effect of the nitrogenous manures, where the rainfall has been favourable; this effect is evidenced chiefly by the improvement in appearance, and the deepening of the colour, of those canes that have received the treatment. It is probable that, where both nitrate of soda and sulphate of ammonia are employed, the signs of the influence of the former manure will be visible before those from the action of the latter. Why is this? (See, in this connexion, *Agricultural News*, Vol. IX, pp. 97-9.) The different methods of application of farmyard manure to land on which sugar-cane is raised should be studied. Discuss the estate value of this manure in relation to the previous crop (from which it was derived), the energy that has been given by the animals supplying it, and the food value that it bears for the coming crop.

Discuss the question of the relationship of rainfall to manuring. In what ways may the presence of readily soluble artificial manures in a soil, during drought, do harm to the plants growing in it? What kinds of damage may long-continued applications of (a) nitrate of soda, (b) sulphate of ammonia, do to a soil, and how may the condition of the soil, that has been produced in each case, be remedied? Give an account of as many reasons as you can for applying lime to soils.

In cases where canes show quickly the effect of dry weather, what examination would you make of them, and what would probably be found as the cause of their condition? State what remedies may be applied in the circumstances of the discovery of the presence of this cause, and indicate how certain of these are fitted particularly to special circumstances.

Some of the islands of the West Indies, and especially certain districts in them, are liable to suffer from a shortage of fodder during the dry season: this may take place to such an extent as to cause the loss of cattle through starvation. Give an account of any methods that may be devised for maintaining the supply of fodder during times when the weather is too dry for the grass to grow. What circumstances, besides lack of rainfall, may make it difficult or impossible to grow a reasonable supply of pasture grass and fodder? Attempts have been made to produce fodder in some of the West Indian islands for use in others, where there is a shortage. (See, more especially, *Agricultural News*, Vol. VIII, p. 131.) What is the best time for cutting grass to be made into fodder? Give reasons.

During the present quarter, opportunities will be available for effecting repairs to fermenting and curing appliances on cacao estates, so that this work may be taken up without delay when the next crop is being gathered. On what circumstances does the quality of cacao depend chiefly? Discuss the advisability of introducing delicate varieties of cacao, giving a superior product, into (a) estate cultivation, (b) peasant cultivation.

In part of a lime plantation, where the trees had, so far, appeared to be reasonably healthy, the leaves on the plants were seen to turn yellow as soon as they grew to a fair size, while less power of resistance to disease was shown by these plants, and, ultimately, several of them died. It was noticed that the yellowing of the leaves took place to the greatest extent during the occurrence of periods of heavy rainfall, or soon after their termination. What was the probable cause of the ill health of the trees, and what remedies would you suggest in such a case?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the chief reasons for mulching soils? Explain what is meant by dry farming.

(2) Why do plants wilt after being transplanted?

(3) What is a weed? How do weeds chiefly interfere with the growth of cultivated plants?

INTERMEDIATE QUESTIONS.

(1) Why is cotton seed meal used as a food for cattle? Compare the proportions of its chief food constituents with those in cane tops or grass

(2) Give an account of the chief phosphatic manures.

(3) Compare the action of leguminous and non-leguminous crops, when they are used as green dressings.

FINAL QUESTIONS.

(1) Give an outline of a complete scheme of cotton selection, without definite breeding (crossing). What is the limit to obtaining improved plants by means of such selection?

(2) Indicate, in a general way, the food requirements of the different kinds of stock on an estate, in relation to (a) time of year; (b) kind of work; (c) age of the animals.

(3) Give an account of the records that should be kept on a good cotton, cacao or lime estate, and indicate the particular relation of each of these to the commercial results attained eventually.

The St. Vincent Arrowroot Growers' and Exporters' Association.—The issue of the St. Vincent *Sentry* for July 29, 1910, states that a meeting of the newly formed St. Vincent Arrowroot Growers' and Exporters' Association, which has been organized for the protection of the arrowroot industry of that colony, was held on July 23, 1910. This was presided over by his Honour the Administrator, and its purpose was to consider the adoption of the rules and constitution of the Association, and to elect a Committee of Management. In the result, the rules were adopted, and the following were elected to serve on the Committee: the Hon. C. J. Simmons (Chairman), the Hon. J. G. W. Hazell, the Hon. D. A. McDonald, Mr. G. R. Corea, and Mr. J. E. Sprott (Secretary).

FUNGUS NOTES.

TWO INTERESTING FUNGI IN ST. LUCIA.

A short time ago, two specimens of fungi were forwarded to the Head Office by Mr. J. C. Moore, Agricultural Superintendent in St. Lucia. The first occurred on a piece of guava stem, and in its general appearance was similar to the pink disease of cacao. The guava stick was being used to support a cacao branch, but no pink disease was observed on that tree, though it was evident on another one some little distance away. The fungus formed smooth, pinkish or buff-coloured patches, spreading all over the bark of the host. These patches consisted of closely woven hyphae very firmly adpressed to the surface upon which they were growing. As it seemed possible that the fungus might attack cacao, or might even be the same as *Corticium lilacino-fuscum*, B. and C. [formerly known, owing to inadvertence, in the publications of this Department, as 'Corticium lilaco-fuscum'], which is responsible for pink disease, a portion of the specimen was sent to Kew, where it was identified as *Corticium laeve*, Fr. This fungus is a common saprophyte on dead pieces of the wood and bark of several trees in England, and occurs in North America, the West and East Indies, and Australia, as well as in Europe. It does not seem altogether impossible that it might attack cacao parasitically, just as *Corticium lilacino-fuscum* does, in which case the treatment recommended against the latter fungus would be found effective in the case of the former The treatment referred to will be found fully described in the *Agricultural News*, Vol. VII, p. 237, and need not be given here. It suffices to add that, according to Mr. Moore, it is proving successful in the case of the cacao tree already mentioned as being attacked by the pink disease.

Two or three other species of this genus are known to attack many different economic host plants in various parts of the tropical world. Since this is the case, a somewhat more general account of the group may be found of interest. The genus Corticium belongs to the family Thelephoraceae of the Hymenomycetineae. (See *Agricultural News*, Vol. IX, pp. 158, 159 and 190.) The members of the genus have a waxy or fleshy superficial fructification, closely adpressed to the substratum, and varying in colour from nearly white to buff, pink, or rose-red; in some species the margin of the fructification is somewhat rolled back. The spores are colourless, and are borne on typical basidia. These latter are produced closely packed together at right angles to the surface of the patch. The spores are thus formed freely in the air, and can be distributed by wind or other agencies. One species of this genus, *Corticium javanicum*, Zimm., is reported by Petch as occurring on Hevea, tea, Cinchona, orange and plum in Ceylon. (*Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 21.) On rubber it usually originates at the fork of a tree, or where several branches arise together from the main stem. The hyphae can gradually penetrate the bark and cause it to die, and split off. The wood is scarcely attacked at all. The fungus can be removed at an early stage without injury to the bark, merely by scraping; but later, it completely covers the circumference of the tree, and the bases of the adjacent branches. Young stems about two years old are rapidly ringed and killed, so that the effect of the fungus is to kill the small lateral branches, and to cause portions of the bark of the main stem and the larger ones to split off. Young trees should be cut back below the affected part; in the case of older trees which are not badly attacked, the diseased bark should be cut out, and the wound tarred. In advanced cases of the attack on older trees, the stem must be cut back as in the case of the younger plants. On tea, the fungus begins by forming pink incrustations on the younger branches, which lose their leaves and die back. From Petch's account, the disease of Hevea and tea in Ceylon appears to be of a more serious nature than that of cacao in the West Indies. In Java, Zimmermann and others have found *Corticium javanicum*, on coffee, ramie, cacao, Cinchona, nutmeg, tea, Eriodendron, pepper, coca, cinnamon, Cola, Castilloa, Hevea, dadap, annatto (*Bixa Orellana*), mango and many trees and shrubs of minor importance. It occurs on Hevea in Southern India, and is probably the species that is found on ramie and Strobilanthes in the Strait Settlements, according to Ridley. Another, *Corticium calceum*, Fr., has been reported from the Federated Malay States as causing injury to Hevea almost identical with that in Ceylon. (*Agricultural Bulletin of the Straits and Federated Malay States*, Vols. III, p. 173; IV, p. 423; V, p. 69.) Petch suggests that the identification of the fungus in the Federated Malay States is possibly incorrect. Lastly, there is another species somewhat different in appearance, which causes thread blights in Java. This is *Corticium theae*, Bern, which was described in the *Agricultural News*, Vol. IX, p. 206, so that no further description need be given here. To summarize, the species of this genus occur as parasites on many plants, including such important economic trees as mango, nutmeg, tea, coffee, cacao and rubber, and have been found in the West Indies, Java, Ceylon, Southern India and the Federated Malay States.

The other fungus mentioned at the beginning of this article was also forwarded by Mr. Moore. It was growing on branches of lime, and, according to the information received, is frequently associated with the death of the parts affected. This one may be observed wherever limes are grown in St. Lucia. It forms superficial, violet-grey, waxy patches, often completely encircling the branch and covering it for considerable distances. It is very easily detachable and, when removed, is seen to be of a dark-brown colour on the surface next to the substratum. It may be mentioned further that a moderate number of scale insects, particularly the purple scale (*Mytilaspis citricola*), and the green scale (*Lecanium viride*), apparently in a perfectly healthy condition, may be found on the surface of the branches beneath the fungus.

The specimen was identified at Kew as *Thelephora pedicellata*, Schwein.; the genus is related to Corticium and included in the same family. Galloway, in the *Journal of Mycology*, Vol. VI, p. 113, states that it occurs on pear branches in Alabama, on oak (*Quercus cocinnea*) in New Jersey, on Palmetto (*Sabal Palmetto*) in Florida, and on apple trees in Texas. On all these, it is capable of doing damage, but will yield readily to treatment. Galloway suggested cutting out all the diseased wood, washing the wounds with a saturated solution of iron sulphate, and covering them with shellac or grafting wax. This treatment seems to be rather unnecessarily drastic; probably the following would be found effective. Remove and burn all dead branches, and tar the cut ends; in the case of living branches, paint the parts attacked with the lime-sulphur mixture recommended for pink disease of cacao. (For reference see above.) This should be all that is necessary, as the fungus does not appear to penetrate the host to any serious extent, and may only kill the affected parts by suffocating them. The disease does not seem to be of a very serious nature, as, though apparently fairly wide-spread, it should yield very rapidly to treatment, more especially on account of its very superficial character.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of July :—

The markets in drugs and spices still continue quite of an ordinary nature, and this notwithstanding that, at the time of writing, the holiday season is in its fullness. A few articles in the market still attract a large share of attention, such, for instance, as Buchu leaves and India rubber. With regard to the first, the greatest interest was taken at the last drug sale on July 28, when some very keen bidding took place over a quantity—in all 6 bales—of round Buchu, 4*s.* 8*d.* to 5*s.* 10*d.* per ℔. being paid for fair to good green; ovals realized 2*s.* to 2*s.* 2*d.* per ℔., showing an advance of 1*d.* per ℔. over previous prices. India rubber, at the time of writing, is having a decided tendency to decline, fine hard Para being quoted at 8*s.* 9*d.*, which a fortnight back realized 10*s.* 6*d.*

The following are some of the principal details of West Indian produce:—

GINGER.

The month opened with little or no demand, and at the first auction no Jamaica was offered; Calicut was represented by 254 packages, none of which, however, was sold. At the second auction on the 13th, Jamaica was in steady demand, 130 packages being disposed of at the following rates: middling 58*s.*, ordinary to good 50*s.* to 54*s.*, and rhatoon 46*s.* to 48*s.*; 60*s.* was the price asked for good bold, brown Calicut, 90*s.* for bold cut Calicut, and 65*s.* for medium cut, at which prices all the offerings were bought in. No further change has taken place in this article.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At the spice auction on the 20th, nutmegs were represented by 385 packages of West Indian, most of which sold at irregular rates. At the same sale, mace was represented, also, by 50 packages of West Indian, which sold at the following rates: for good 1*s.* 11*d.* to 2*s.* 1*d.*, fair 1*s.* 8*d.* to 1*s.* 9*d.*, mixed 1*s.* 6*d.* to 1*s.* 7*d.* But very little change has taken place in Pimento during the month; 2¼*d.* was the price paid at the second auction on the 13th. On the 20th, 58 bags were offered, and part sold at 2¼*d.* to 2⅜*d.* A week later, a consignment of over 130 bags was offered, part of which sold at 2¼*d.* per ℔. For arrowroot there has been but very little demand; 106 barrels of St. Vincent were brought forward at the spice auction on the 20th, and the whole was bought in at 2*d.* per ℔.

SARSAPARILLA.

At the drug auction on the 14th, sarsaparilla was represented by 25 bales of grey Jamaica, 23 of Lima-Jamaica, and 22 of native Jamaica. The whole of the grey Jamaica was sold at rates from 1*s.* 1*d.* to 1*s.* 3*d.*, for qualities varying from inferior rough and chumpy to fair. Of the Lima-Jamaica, 7 bales out of 23 offered found buyers, 10½*d.* per ℔. being paid for 4 bales of ordinary, somewhat chumpy. Of the 22 bales of native Jamaica, only 9 were sold, 1 fetching 11*d.* per ℔. for fair red, and another 8*d.* per ℔. for inferior yellow; for the other 7 bales of dull yellow to good red, 9*d.* to 10½*d.* per ℔. was paid. At the auction on the 28th, sarsaparilla was again in good supply; 11 bales of genuine grey Jamaica were offered, and all sold at from 1*s.* 2*d.* to 1*s.* 3*d.* per ℔. Native Jamaica was represented by 26 bales, buyers being found for 6 bales only, 3 of which realized 10*d.* per ℔. for fair red, and the remaining 3 were sold without reserve at 8*d.* to 8½*d.* per ℔.: 16 bales of Lima-Jamaica were brought forward, and 4 sold, 2 fetching 9½*d.* per ℔. and the remaining 2, 10*d.* per ℔. Three bales only of Honduras were offered and none sold, 1*s.* 3*d.* being the price asked. For 47 bales of Guatemala character offered, the whole was bought in at 9*d.* per ℔.

LIME JUICE, OIL OF LIME, TAMARINDS.

At the beginning of the month there was a steady demand for lime juice, 1*s.* 3*d.* being paid for good pale. It was reported that the market had been cleared of cheap and inferior quantities. At the last auction in the month a bid of 1*s.* for pale raw West Indian was refused, 1*s.* 3*d.* being the price asked. The arrivals amounted to 118 packages from Dominica. For West Indian distilled oil of lime, 1*s* 5*d.* to 1*s.* 6*d.* per ℔. was paid towards the end of the month, 21 packages being reported as having arrived from Dominica, and later 11 packages of hard pressed West India were reported, four of which sold at 6*s.* per ℔. Tamarinds were in good supply, at the auction on the 13th, as many as 109 packages being offered; 72 barrels were from Barbados, 39 of which sold at from 12*s.* to 14*s.* per cwt. in bond.

In my summary of the markets for the month of May, published on page 207 of the *Agricultural News* for June 25, an error occurred with reference to nutmegs and mace. Referring to the advance in the prices of nutmegs over previous rates, the figures should be ¼*d.* and ½*d.* per ℔, instead of 1*s.* 4*d.* to 1*s.* 2*d.*; the same with regard to mace, instead of 1*s.* 2*d.* to 1*d.* per ℔., it should read ½*d.* to 1*d.*

THE BANANA INDUSTRY OF COSTA RICA.

The total export of bananas during 1909 was 9,365,690 bunches, having been a decrease of 6·9 per cent. from the quantity exported during 1908.

The following figures serve to illustrate the situation of the banana industry of Costa Rica, which industry grew up very rapidly and steadily until 1907, and since then, has remained more or less stationary as regards area planted:—

	Bunches exported.	Percentage of increase on export of the previous Year.
1905	7,283,000	+20·07
1906	8,872,729	+21·82
1907	10,165,759	+14·57
1908	10,060,009	— 1·04
1909	9,365,690	— 6·90

In July, the export tax, for twenty years to October 29, 1910, was fixed at 1c. (gold) per bunch exported, by decree of Congress; this measure, ensuring the industry, as it does, against any greater or additional taxation, will give confidence to planters, and will enable the United Fruit Company to enter into contracts with the growers for their fruit; and, in consequence, the area under bananas is once more being increased, and some railway extensions are in progress to carry the produce of the new plantations.

The bananas exported in 1909 were shipped as follows: to the United States 7,861,861 bunches, and to the United Kingdom (Bristol) 1,503,829 bunches, making a total of 9,365,690 bunches. (*Diplomatic and Consular Reports, Annual Series*, No. 4469.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 16, 1910; Messrs. E. A. DE PASS & Co., August 5, 1910.

ARROWROOT—St. Vincent, 1⅞*d*. to 2*d*.
BALATA—Sheet, 3/-; block, 2/3 per lb.
BEESWAX—£7 10*s*.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 48/- to 52/6; Jamaica, 46/- to 52/-.
COFFEE—Jamaica, 44/- to 51/6.
COPRA—West Indian, £27 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 59/- to 65/-.
HONEY—25/- to 30/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d*. to 1/2; concentrated, £18 5*s*. to £18 10*s*.; Otto of limes (hand pressed), 6/-, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, 2⅛*d*.; fair, 2¼*d*.; good, 2⅜*d*. per lb.
RUBBER—Para, fine hard, 9/6, fine soft, 8/9; fine Peru, 9/- per lb.
RUM—Jamaica, 1/10 to 5/-.
SUGAR—Crystals, 17/- to 19/-; Muscovado, 13/- to 14/9; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., August 5, 1910.

CACAO—Caracas, 10¾c. to 11¼c.; Grenada, 10⅝c. to 10⅞c.; Trinidad, 10½c. to 11c.; Jamaica, 9c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $34·00 to $35·00; culls, $18·00 to $19·00; Trinidad, select, $34·00 to $35·00; culls, $18·00 to $19·00 per M.
COFFEE—Jamaica, ordinary, 8¾c. to 9c.; good ordinary, 9⅞c.; and washed, up to 11½c. per lb.
GINGER—8¾c. to 11½c. per lb.
GOAT SKINS—Jamaica, 55c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—$5·00 to $6·00 per box.
LIMES—$6·50 to $7·00.
MACE—32c. to 38c. per lb.
NUTMEGS—110's, 8¾c. to 9c. per lb.
ORANGES—Jamaica, $2·50 to $3·00 per box.
PIMENTO—4⅜c. to 4½c. per lb.
SUGAR—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., August 20, 1910.

CACAO—Venezuelan, $10·75 to $11·00 per fanega; Trinidad, $10·65 to to $11·00.
COCOA-NUT OIL—$1·14 per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$4·30.
ONIONS—$2·25 per 100 lb.
PEAS, SPLIT—$5·90 to $6·00 per bag.
POTATOS—English, $2·00 to $2·25 per 100 lb.
RICE—Yellow, $4·70 to $4·80; White, $5·40 to $5·50 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., August 27, 1910; Messrs. T. S. GARRAWAY & Co., August 30, 1910; Messrs. JAMES A. LYNCH & Co., August 22, 1910.

ARROWROOT—St. Vincent, $3·30 to $3·75 per 100 lb.
CACAO—$11·00 to $12·00 per 100 lb.
COCOA-NUTS—$18·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·50 per 100 lb., scarce.
HAY—$1·20 to $1·40 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $3·00 per 100 lb.
PEAS, SPLIT—$6·00 to $6·25 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $3·60 to $4·00 per 160 lb.
RICE—Ballam, no quotations; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, August 20, 1910; Messrs. SANDBACH, PARKER & Co., August 19, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·50 to $8·00 per 200 lb.	$7·50 to $8 00 per 200 lb., mkt. dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	80c.	No quotation
CASSAVA STARCH—	$6·00 per barrel of 196 lb.	No quotation
COCOA-NUTS—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$3·65 per bag of 168 lb.	$3·60 per bag of 168 lb.
Green Dhal	$4·60	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		—
Madeira	2¼c. to 2½c.	2¼c. to 2½c.
PEAS—Split	$5·50 to $5·60 per bag (210 lb.)	$5·65 per bag (210 lb.)
Marseilles	$4·25	No quotation
PLANTAINS—	20c. to 60c. per bunch	——
POTATOS—Nova Scotia	None	$2·50
Lisbon	——	No quotation
POTATOS—Sweet, Barbados	$1·68 per bag	——
RICE—Ballam	None	——
Creole	$5·00 to $5·30	$5·00 to $5·50
TANNIAS—	$1·92 per bag	——
YAMS—White	$3·00	——
Buck	$3·36	——
SUGAR—Dark crystals	$2·95 to $3·00	None
Yellow	$3·50 to $3·60	$3·70
White	$4·00 to $4·10	$4·00 to $4·25
Molasses	$2·25 to $2·60	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Maintenance of Soil Productivity.

In most parts of the world, agricultural practice has reached the stage of full recognition, in individual cases, of the necessity of keeping up the fertility of the soil by approved methods. An understanding of the needs of the soil has been gained, so that there is a decreasing tendency to take whatever this may yield, without treating it in ways which will prevent its exhaustion. This phase of the methods of agricultural production is naturally of the greatest importance, especially as it enables the area concerned in that production to be conserved effectively.

The principles of the maintenance of soil productivity are, however, usually employed in a narrow way only. They are considered to relate to matters on a particular estate, or group of estates, or to the production of one given crop. This is insufficient where the agricultural welfare of a whole district, or colony, is concerned. Such welfare depends mainly on the level of the agricultural efficiency of the inhabitants, and therefore on the extent to which agricultural methods suited to the particular conditions are in vogue. Individual effort may be of use in limited areas, but in countries where the means of production are generally inferior, those areas, alone, will profit by it, and the very existence of this inferiority will increase the difficulty of the effort, and lessen the value of its results.

This matter possesses a special importance in regard to districts or colonies which have become noted for a particularly high grade of some definite commodity, because of the large area from which this comes, and on account of the speedy deterioration, and consequent reproach, that it will suffer in the event of its production under less favourable circumstances. A reason is thus given for the exercise of the greatest care to prevent negligence in the course of this production, and thus to ensure that the soil, in which the plants grow that yield the commodity, shall not be made to furnish this in amounts too great for its capacity, or be permitted to undergo exhaustion on account of neglect. Once such untoward circumstances are allowed to come into being, the efforts of individuals to remedy matters are of little use. There is need for a wide consideration of affairs, and the adoption of methods which will improve agricultural conditions in a perfectly general way.

Wherever there is a low level of agricultural production, owing chiefly to the lack of a proper general procedure in relation to it, conditions are rendered doubly unfavourable because of the want of means to attract capital. In such cases, indeed, the usual effect is one of actual repulsion, and it is unlikely that outside money will be available, for helping in the amelioration of conditions, unless there is evidence of the possibility of the adoption of measures which will lead to a general improvement of the circumstances surrounding and limiting agricultural production.

Means have therefore to be found which will prevent deterioration, where this is likely to take place; as well as to arrest it, where it is already known to be in evidence. The tendency, as a matter of fact, should be always toward improvement, for in no case has perfection been attained, and the conscious striving toward this will have its effect in regulating any inclination toward lessened efficiency. These means are sufficiently obvious, and include those of special, as well as of a more general, application.

The more special methods toward attaining what may be termed agricultural conservancy have relation to such matters as the prevention of the loss of soil by washing during heavy rains, and in other ways, as well as that of the permanent lessening of the amount of the more readily available plant food in it. In the latter connexion, the more general employment of the rotation of crops, green dressings and artificial manures, is indicated as a natural remedy. In addition, there is the keeping of stock in quantities adequate to maintain the proper relation between the vegetable produce of the estates, the energy required on these, the maintenance of the proper state of fertility of the soil, and the food-supply of the inhabitants. The far-reaching importance of the raising of a sufficient amount of stock in a country is not often realized, and the provision of means to do this is a difficult problem where the crops are chiefly of a permanent nature.

The general means toward the end that is being discussed have reference, like the special ones, firstly, to the prevention of the washing away of soil at times of heavy rainfall. They are thus made to include reafforstation—a subject whose importance does not require any argument. A second matter, broad in its application, is the greater use of waste substances as manures. Many such products, of large value in the aggregate, are thrown away or destroyed, when they could be utilized as stated, even if this entailed a certain amount of preliminary preparation. The case of the exportation of edible products, particularly when these are by-products, is somewhat similar, as the price obtained for them is often not fairly representative of their value as foods for stock: the connexion of their greater use in reference to increased stock-raising is obvious.

The consideration of these general means toward the maintenance of soil fertility includes, however, a matter that is becoming of greater importance as time goes on, namely the question of diversified agriculture. This is too large a subject, in its various connexions, to treat here adequately. It is evident, however, that in relation to what may be termed the agricultural balance of a country, there is a certain distribution of the crops over the land available for them that is the most effective in regard to the general economy of production. It would be difficult, to express it shortly, to know when the distribution that is most efficient has been obtained, but much can be done toward its attainment by increasing the number of kinds of crops grown. One result of this diversification of crops will be to afford a certain amount of relief to the strain of production by the soil, as well as to give the best chance of the mutual provision of many of the materials that are required in the raising of the different products.

The mention of the most obvious general means toward the conservation of the resources that are contained in the soil has been left until the last. It is sufficiently self-evident that this means is included in education. Much has been done in the past to elucidate the best methods in connexion with this, and the investigation can be said to have passed the experimental stage. It now remains to extend the practical application of its results, so that, with the spread of agricultural knowledge, there will be brought about a greater respect for the soil as a producer, and a better appreciation of the inter-dependence of the factors that limit production.

All the different phases of agricultural production, in a given community, react on one another, and the state of the general efficiency has a limiting effect on the progress of any one of them. This is because this state of efficiency does much to regulate the extent to which the fertility of the soil is maintained. The prosperity of such a community, therefore, depends on the value of its inhabitants as agricultural workers, so that, if this is to be maintained or increased, there must be a wide recognition of the necessity for general effort toward improvement.

THE NEW YORK SUGAR TRADE LABORATORY.

With reference to a description of this laboratory that appeared in the *Agricultural News*, Vol. IX, No. 202, the following notes, prepared by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, after a visit to that institution by him, are of particular interest. They relate more especially to the details of the methods of sugar-testing, and thus help to make the account complete:

The normal weight of sugar is weighed out, transferred to a flask by means of a sugar funnel and dissolved in water, a shaking machine being used to facilitate solution. Clarification is effected by means of basic lead acetate solution, using the least quantity required to promote clarification. The laboratory is fitted with a special room in which the operation of polarizing the samples is performed, the temperature of which can be maintained constantly at 20° C. In summer, the air is cooled by means of an ammonia refrigerating apparatus; in winter it is warmed by means of a radiator. The temperature is checked by means of an automatic temperature recorder. After the samples have been dissolved, they are transferred to this room and allowed to assume a temperature of 20° C. before making up. When this has been attained they are made up to 100 metric (true) cubic centimetres, filtered and polarized, the usual precautions being adopted to prevent loss by evaporation. The polarimeters used are specially constructed Schmidt and Hänsch instruments, standardized at a temperature of 20° C., for a normal weight of 26 gm. of sugar dissolved in water, and made up to a volume of 100 true cubic centimetres; they are of the half-shadow type, and are illuminated with electric light. By this means, all necessity for temperature corrections is avoided, since the samples are made up and polarized at the temperature of standardization of the polarimeter.

The sugars are bought and sold on the means of the three tests, namely, that of the brokers' chemists, that of the refiners' chemists, and that of the sugar trade laboratory.

TRINIDAD, ST. VINCENT AND TORTOLA, AND THE CANADIAN EXHIBITIONS.

The following account of the exhibits sent from Trinidad appeared in a recent number of the *Port-of-Spain Gazette*:—

One of the principal features of the Trinidad stall will be the serving up of the pure chocolate manufactured by Messrs. Cowan & Co., of Canada, from cacao sent by local dealers, to persons attending the show. The exhibits are arranged in five sections, the first of which aims at showing the cacao from its germinating stage to its various products. This part of the exhibit is made up of material preserved in formaldeyhde vapour and formalin. Living plants and herbarium specimens are also included in this section, so are drugs derived from cacao, such as oil of theobroma and the alkaloid theobromine. Photographs of cocao in various processes of curing, and specimens demonstrating the chocolate manufacture, have been taken by Mr. Jacobson, and will accompany the exhibits. Material in this section has been generously furnished by the Department of Agriculture, Messrs. Gordon, Grant & Co., Lucien's Chocolate Factory, L. Krauth, and rom Valdeora estate. The second section consists of samples of estate cacao from the principal estates in the colony, including Soconusco, Ortinola, La Vega, San Antonio, McBean, San Remo and La Mascot. Section three comprises commercial samples of well-known brands of the golden bean, viz., Fontabelle. Bell Vue, Dulcimona, Costa Ariba (all from Gordon, Grant's). Trinidad planters and superior Venezuela—Paul H. Scheerer & Co.; La Gloria—George R. Alston & Co., Pueblo and San Vincente Lascelles, de Marcado & Co.; fine plantation and ordinary Trinidad—A. G. Porteous & Co. Ltd.; Esperanza—L. J. Bernstein & Co.; dark and light graded—Cocoa Planters' Association; Trinidad estates and ordinary—F. J. Alden. In section four are displayed products of the Trinidad chocolate mannfacturers, Messrs. A. Soublette, L. Krauth, and Lucien & Co., who are exhibitors in this section. The fifth section is devoted to the different varieties of the Trinidad cacao. In it will be found those sent by the Department of Agriculture, some of which have been preserved in formalin, and others which are intended to be shown in a fresh state, in formaldehyde vapour. Some hundred photographs illustrating the cacao industry and views of the colony itself have also been sent, as well as copies of Mr. J. H. Hart's well-known treatise on cacao.

The St. Vincent *Sentry* gives an account, as follows, of the exhibits sent from that colony to the Toronto Exhibition:—

The first instalment of local exhibits for the coming Canadian Exhibitions was forwarded, under the auspices of the Permanent Exhibition Committee, by the S.S. 'Ocamo'. Mr. W. H. Patterson, of the Agricultural Department, discharging the onerous duties of secretary with his usual zeal, has succeeded in getting together an admirable collection of exhibits, representing all the industries of the colony. For the Toronto Exhibition, which comes off first, from August 27 to September 9, four cases have been despatched, containing bottled samples of sugar, molasses, starches, cacao, rum, honey, peas, beans—of which there is also a collection of the wild varieties for ornamental purposes—preserved fruit and pickles. There is also a collection of specimens in boxes. Pretty samples of our famous Sea Island cotton, and the finest qualities of St. Vincent arrowroot have been despatched among the exhibits, and relying on the decorative taste of representatives of Messrs. Pickford & Black, who have undertaken to arrange the specimens from the West Indies and British Guiana, we venture the opinion that the St. Vincent table or stand, although smaller, may be as interesting and attractive as any in the Colonial Section. There will be yet another opportunity of sending up perishable exhibits for the St. John's show, and then some of our vegetables may be forwarded. We observe, from a glance at the samples, that Mr. C. J. Simmons is particularly prominent among the exhibitors. He has taken the trouble of sending specimens of every variety of produce from his estates. Such a practical display of interest in the movement is worthy of commendation, and the whole colony is indebted to him; for the good that may result from the exhibition would reflect on St. Vincent in general, and the benefit would be shared by every local producer of the article for which a demand has been thereby created.

A communication received from Mr. W. C. Fishlock, Agricultural Instructor for the Virgin Islands, shows that he has arranged the despatch of samples of the following articles for the Canadian Exhibitions: cacao and coffee in bottles and bags; sugar, arrowroot, tous-le-mois starch, concentrated lime juice, preserved limes and rum, in bottles; cassava cakes; native hats; and Sea Island and native cotton.

FRUITS AND FRUIT TREES.

THE JAFFA ORANGE.

The Bureau of Plant Industry of the United States Department of Agriculture has recently published Bulletin 180 of its series, which contains an account of recent agricultural and botanical explorations in Palestine. Among the information given, there occur particulars of the Jaffa orange, and that part of the bulletin which deals with this is reproduced below:—

All the crops mentioned have been cultivated for centuries in the Orient, but oranges were introduced there at a relatively recent date.

Hasselquist, a pupil of Linnæus, who was the first naturalist to study Palestine, in the middle of the eighteenth century, speaks of the beautiful gardens of figs and pomegranates at Jaffa, but has not a word to say about oranges. This silence is significant. But at the time of Napoleon's Egyptian campaign, at the close of the eighteenth century, the orange was mentioned among the fruit trees. Chateaubriand, who travelled in the beginning of the nineteenth century, also speaks of this fruit. Lamartine, visiting Palestine in October 1832, praises the beauty and quality of the Jaffa orange, but speaks of having seen the flowers and the golden fruits at the time of his visit. Now, at this season of the year it was too late for the trees to have been in bloom and not late enough for the fruits to be ripe. This and other errors of observation cause me to doubt the value of the poet's description, from the point of view of the naturalist and agriculturist, although its value as literature is unquestioned.

At any rate, in the second half of the nineteenth century, the Jaffa orange was known in the markets for its superior quality. It was exported by sailing vessels all along the Syrian and Egyptian coasts. Its thick skin made it a good shipper, and it was carried as far as Constantinople, and into Greece. It was not until 1875, or thereabouts, that it was exported to England, while to-day Liverpool alone takes about 500,000 to 600,000 cases of the 700,000 or 800,000 that are annually exported

I have not been able to learn the origin of this variety which is cultivated only at Jaffa. In form, it is very similar to the Malta orange, and it is possible that it is remotely descended from that variety; but it is not a blood orange, despite its marked affinity to that group.

The Jaffa orange is one of the largest, larger even than the Washington Navel. Its form is obovate, its skin very thick, and its fruit seedless. The tree is not spiny, and the fruit, therefore, is never scarred. Its shipping qualities are excellent. It is packed with very little care, as compared with the methods used in California. The cases are thrown violently into the steamers, and they are often carried for three weeks without refrigeration, and subjected to the greatest extremes of temperature; and yet the oranges reach the English markets in good condition and command good prices. It is at least a month from the time they are picked until they are purchased by the wholesale dealer, and during all that time they are without cold storage.

Not only is this orange peculiar to Jaffa, but peculiar methods of cultivation and peculiar stocks are there in use. The Schamouti, as the Jaffa orange is called, is generally grafted on a special sweet lime, which I have not found either in Africa (Algeria and Tunis) or in the United States. It is sometimes, though more rarely, grafted on the bitter orange (*Citrus Aurantium*). This is not so well liked, because it requires more irrigation, and is later in fruiting.

I must add that the Jaffa oranges which I saw in Tunis and Algeria, and those grown in America and illustrated in American publications, have very little resemblance to the real Jaffa orange. They are represented as having seeds, while the true Jaffa orange is seedless.

Saida, the ancient Sidon, is another centre of orange production. Many different stocks are used, and several varieties of oranges are known. Two of these are blood oranges, one called 'Damaoui' (blood) and the other 'Hutmali' (meaning 'ringed', because it has a ring around the base). These two varieties are very popular. The 'Beledi' (seedling) is also grown. This commonly yields 3,000 fruits to the tree, and sometimes as many as 5,000.

Fruit Exportation from Natal.—In connexion with the articles on the export of fruit from Natal that appeared in Nos. 213 and 214 of the current volume of the *Agricultural News*, it may be noted that the *Natal Agricultural Journal* for July 1910 states that the hope of building up a large export of Natal mandarins gives no promise of speedy realization, and that it is doubtful if the trade in the fruit will ever attain large proportions. This is mainly because it reaches the London market at a time when other fruits are plentiful, so that the prices obtained for it are often unremunerative.

IMPROVEMENTS IN INDIAN AGRICULTURE

The means that are being employed in different parts of the world for the improvement of agricultural methods, particularly under tropical conditions, cannot fail to be of interest to agriculturists in the West Indies. It is for this reason that some of the chief general points in a booklet entitled *Report on the Introduction of Improvements into Indian Agriculture*, issued by the Inspector General of Agriculture in India, are summarized here:—

The essential difference between Agricultural Departments in the East and in the West is that the latter have arisen to meet the spontaneous demands of the cultivators of the soil, whereas the former have been lately created by a bureaucratic Government anxious to give all the assistance it can to its agricultural subjects. The demand for improved agriculture has not in India, except in special cases, come from the cultivator. While, therefore, in the West the cultivator is naturally in direct touch with the Department of Agriculture, in India it is necessary for the Department to put forth every effort, first to ascertain the needs of the cultivators and then to demonstrate how they can most effectually be met. The subject of the present report is a consideration of the methods by which these ends have been attained, and of the improvements which have been introduced as a result.

AGRICULTURAL ASSOCIATIONS. The formation of local associations or societies, which have as their object the improvement of the agriculture in the district, has been one of the most common methods employed for increasing interest in the subject and bringing the Agricultural Departments into immediate touch with the people.

LOCAL DEMONSTRATIONS. It must be recognized that local demonstration of any improvement it is desired to introduce, is one of the most, if not the most, effective method of securing its adoption. Considerable success has, indeed, been achieved along these lines. In the case of this method, however, very special adaptation to local conditions is necessary, and it is impossible to lay down any scheme which will be of general application.

VILLAGE AGENCIES. It has always been a problem of considerable difficulty, in connexion with the introduction of new implements, to get such as are of undoubted value adopted by the cultivators, but the institution of village agencies, as devised in the United Provinces, promises success. These are managed by local agents, with whom implements are placed, and from whom they can be hired out or sold. Before the agency is established, the use of the particular implement is always demonstrated carefully to cultivators on the spot. A member of the staff of the Agricultural Department then visits such agencies from time to time, accompanied by a *mistri*, who can repair the implements. He also visits the cultivators who have adopted them, ascertains whether they are working satisfactorily, and arranges for such repairs as are necessary.

VERNACULAR AGRICULTURAL JOURNALS. These have been established in several parts of India by the Agricultural Departments.

LEAFLETS AND CIRCULARS. In many countries, one of the best means of bringing practical agricultural information to the cultivators of the land has been the issue of leaflets and circulars couched in popular language. In India, where the standard of education is lower than in most Western countries, the value of such publications is more problematical, but they have frequently been used with success.

AGRICULTURAL SHOWS AND EXHIBITIONS. These, provincial or local, have been held in every province in India. Large provincial shows have been held in Bombay in 1904, in Calcutta, and in Nagpur in 1908, in connexion with large industrial exhibitions.

ITINERANT ASSISTANTS. In Bombay, some of the senior assistants of the department have been employed for a number of years in travelling in the districts, and this method of introducing improvements, getting in touch with the cultivators, and finding out the local difficulties has been so successful that a considerable extension of the system is being made. Experience has shown that only men specially chosen as being able to win the confidence of cultivators should be sent. Further, they are always sent out to tour for definite purposes and are required to furnish frequent reports as to the progress they are making. Definiteness of work and regular supervision are felt to be absolutely essential.

SEED FARMS. Inasmuch as the provision of pure and improved seed is one of the principal needs of the Indian cultivator, and as there are no recognized seedsmen in the country, the Agricultural Department in every province has felt it its duty to arrange for the provision of such seed, and this has proved to be one of the best means of getting into touch with Indian cultivators. Many methods have been used to obtain such seed for distribution, the method followed varying with the conditions of the province and of the class of seed it was desired to supply.

SEED DEPÔTS. Even when the department does not grow seed for distribution, great good can sometimes be done by opening depôts where superior seed, purchased in other districts, can be had by cultivators.

COLONIZATION WITH EXPERT CULTIVATORS. In some parts of India there are groups or castes of cultivators particularly skilled in some class of agricultural work. The importation of a body of these men into a new area will generally raise the standard of cultivation in the district to which there are transferred. The difficulty of getting people to leave their own district is, however, in India always great, and so the application of this method is decidedly limited. But instances of successful colonization of backward tracts in this manner have occurred, some of them of very far-reaching effect.

UTILIZATION OF INDIVIDUAL EXPERT CULTIVATORS. While it is only rarely possible to colonize a backward area with large numbers of better cultivators, it is frequently comparatively easy to induce single men to go to a new tract, as employés of the Agricultural Department, to show the people the methods in which they are experts.

TRAINING THE SONS OF CULTIVATORS. An important departure was made some years ago by starting, at the Nagpur Agricultural School, a one year's course in practical agriculture for training the sons of farmers. The teaching is given in vernacular, and consists almost wholly of practical work on the farm with a minimum of lectures and book work. That some measure of success has been secured in these cases has been shown by enquiries into the work they have been doing in the villages after leaving the college.

OFFICIAL CO-OPERATION. There is a large scope for co-operation between the executive officers of Government and those of the Agricultural Department. The District Officer has a close knowledge of his own district, his influence is great among the people and his appointment as president of the local agricultural association at once gives dignity and status to it. His influence is particularly great in connexion with all matters where co-operative credit is involved, and these will be more and more important as time goes on.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 29, with reference to the sales of West Indian Sea Island cotton :—

No business has been reported in West Indian Sea Island cotton since our last report.

Though no business is reported, the tendency of prices is distinctly easier.

The latest accounts from America of the Sea Island crop are rather more satisfactory.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 6, is as follows:—

Since our last report, of July 2, the market has continued dull, with no demand for the 53 bales stock, consisting of planters' crops, held at 50c. to 55c. The 100 bales on plantations around Beaufort are still on hand.

COTTON EXPORTS FROM THE WEST INDIES.

In the last number of the *Agricultural News*, a table was given of the cotton exports from the West Indies for the quarter ending June 30, 1910, compiled from the statistics that were then available. Since then, information has been received from Jamaica to the effect that the amount of cotton exported from that colony, during the same period, was 26 bales, weighing 10,868 ℔., and having a value of £692 14*s*. All this was Sea Island cotton, and went to the United Kingdom.

This makes the total amount of cotton exported from the West Indies, during the present season, 2,150,403 ℔., having an estimated value of £130,368.

COTTON-GROWING IN MALTA.

The local production of cotton shows a slight improvement, 181,191 ℔. having been obtained during the year, as compared with 175,883 ℔. in 1908-9. The acreage under cotton was 793 acres (as against 823 acres in 1908-9); the average yield was 228 ℔. of lint per acre, and the average price obtained was 6½*d*. per ℔. or 1*d*. per ℔. more than the price obtained in 1908-9. The quantity of cotton exported from the colony was 303,861 ℔., as against 13,906 ℔. in 1908-9, showing an extraordinary increase of 289,955 ℔., which the Inspector of Agriculture attributes to the fact that a considerable portion of the stock of previous years was held back in anticipation of an improvement in the foreign market. The cotton exported in 1909-10 was all sent to Italy or Germany. (*Colonial Reports—Annual*, No. 642.)

GUAYULE RUBBER.

The following information regarding Guayule rubber is taken from the *Kew Bulletin*, No. 6, 1910, p. 211:—

An account of this Mexican source of rubber, derived from *Parthenium argentatum*, A. Gray, was published in the *Kew Bulletin*, 1907, pp. 285-94, with a further note in that for 1908, p. 255. In 1907, some seeds of *Parthenium argentatum*, and also of *P. incanum*—a species sometimes confused with the rubber-yielding plant (*Kew Bulletin*, 1907, p. 294)—were received from the United States Department of Agriculture. The plants of Guayule raised from these seeds are now about 18 inches high and in flower; the stem is woody below, and the silvery leaves, 2 inches long, are lanceolate, entire or in a few cases irregularly lobed or toothed. The plants of *P. incanum* have glaucus or silvery hawthorn-like leaves, and in their crenate lobation differ markedly from the leaves of *P. argentatum*, where the lobes are sharply angular.

Through the kind offices of Mr. Reginald Tower, H. M. Minister, Mexico, two consignments of the seeds of *Parthenium argentatum* were received at Kew in March and April of this year. The first consignment was sent to Mr. Tower by Mr. J. E. Kirkwood of the University of Montana, Missoula, the author of a paper on the 'Propagation of Guayule by Seeds' in the *American Review of Tropical Agriculture*, Vol. I, No. 2, February 1910, pp. 34-43. The second consignment of seeds was sent by Mr. Tower from Mr. G. Fleming of the Hacienda de Cedros, Mazapil, Zacatecas.

The bulk of the seeds so received has been distributed to Mysore, Baroda, Poona, Lahore, Ceylon (Hakgala), Sudan, Pretoria, Nairobi, Queensland, Port Darwin, Adelàide, Sydney and the Antilles.

The germination of the seeds retained at Kew has been good; the plants raised from the latter sending in April are now 6 inches high, and bear somewhat silvery, oblanceolate, slightly lobed leaves, 3 to 4 inches long. The older seedlings are a foot high, the whole plant being covered with a fine silver-grey tomentum; the leaves are 2 to 5 inches long, narrowly lanceolate, and irregularly lobed with angular acute or subacute lobes. Some of the plants, which are already showing flower heads, have been placed in the Succulent House.

In the *Kew Bulletin*, 1908, p. 255, a despatch from H. M. Minister, Mexico, was published, in which the Guayule rubber industry did not appear to have a very bright future; a further despatch received from Mr. Tower, early last year, indicates that the industry is still in a flourishing condition. The Mexican Rubber Exploitation Company now has a large Guayule factory established in the State of Coahuila, and with a new process for the extraction of the rubber they have confidence in the successful development of the industry. According to the statements made by the head of the company: 'Experiments had now satisfied them conclusively that the Guayule plant reproduces itself naturally and abundantly. The roots of the shrub extend to a considerable distance in all directions, and new shoots spring from the roots, growing satisfactorily even after the parent shrub has been cut down. Opinions differ about the life of the plant and as to the suitable time for cutting, but the generally accepted view is that between ten and twenty years must elapse before maturity is reached and the plant contains sufficient rubber for commercial purposes.'

JAMAICA: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE, 1909-10.

General observations by the Director of Agriculture, at the commencement of this report, contain information which shows that a great improvement in the conditions surrounding the Hope Gardens has been effected, and that the ornamental side of the work in all the gardens is being maintained. Another among the several matters of interest that are mentioned in this part of the report is the opening of the Farm School in January 1909, when the applications for admission were so numerous that a large number of intending students had to be refused, and the institution commenced with its full complement. It is pointed out that this circumstance serves as a demonstration of the fact that there is a demand in Jamaica for practical agricultural education, and that the policy of the provision of this is justified.

The detailed reports on the Hope and Castleton Gardens, the Parade Garden, Kingston, the Hill Gardens, Cinchona, and the King's House Gardens, show that the work of the upkeep of these has been energetically continued, and that means of improvement have been adopted in all cases. The distribution of plants from the two first-mentioned gardens was 153,287 and 20,252. Meteorological statistics are given for the gardens, with the exception of the last-mentioned one; they show that the rainfall was respectively, in order, 96·30, 176·69, 69·61 and 189·77 inches. At each of these places, more or less damage was done by the flood rains near the beginning of November; fortunately this damage was of such a nature that it could be repaired easily.

The section of the report on agricultural experiments shows that large demands have been received for tops of the seedling canes B.208, B.147 and D.625. Mention is made of the success and progress of the sugar industry of Jamaica during the year, as well as of the disorganization of the rum market, chiefly on account of the increase in the spirit duties in the United Kingdom. The hope is expressed that the revival of the sugar industry of the colony, with the aid of central factories, will increase the importance of that product among its exports, so that a stable industry may exist alongside the raising of the more speculative crops that at present receive the greatest attention in the island. The part of the report which treats of the fruit industry was reproduced in the last number of the *Agricultural News* (p. 276), to which reference is made for information concerning this.

Among the matters of interest that appear in the report of the Travelling Instructors is that of the effective check of the pod rot disease of cacao by spraying; although this remedy is stated not to be likely to gain the favour of planters, on account of the very careful labour that is required, as well as in some cases, the hilly nature of the ground on which the plantations are situated. Cacao canker has been checked by cutting and tarring. Other matters that have received particular attention in relation to cacao cultivation have been drainage, the provision of wind-breaks and the adoption of sanitary measures. In regard to rubber, more or less success has been attained generally with Castilloa. The other crops that have received the more special attention of the agricultural instructors have been cocoa-nuts, bananas and cacao. Much useful work appears to have been done in relation to prize-holdings competitions and agricultural shows.

The educational section of the report proceeds first to give an interesting account of the Farm School at Hope, to which reference has been made already. The usual lectures in elementary science and agriculture were given to the stuednts at the various training colleges, by the Lecturer in Agricultural Science; the annual course of training in agriculture was held in January, and was attended by forty-five teachers.

The account of the work at the Stock Farm at Hope shows that only negligible losses of stock have occurred during the year. One of the most interesting matters in connexion with this institution has been the efforts to devise a practical method for dealing with the tick pest in Jamaica. This useful piece of work was enabled to be carried out on account of the presence of Professor Newstead in the island.

The analytical work at the Government Laboratory, in connexion with the official samples, showed that the watering and skimming of milk for sale take place to a large extent in Kingston. Examination of 19 samples of so-called butter sold in Kingston showed that only one was genuine, the others being composed of margarine with a large percentage of foreign fat. All the samples of lard investigated contained over 50 per cent. of cotton seed oil. The legal requirements in regard to the flash point of kerosene oil and turpentine appear to be generally fulfilled. Investigations in respect to the water-supply of Kingston demonstrated that this was generally satisfactory. Experiments made to ascertain the effects of Danysz virus on mungoose showed that this produced a fatal disease among them, and a similar result was obtained in trials with rats. The provision of cultures of pure yeasts to sugar estates has caused very satisfactory improvement in the attenuations and yields of rum, and this part of the work appears to be of particular value in connexion with this industry. Finally, it is interesting to note that the employment of the sugar laboratory by estates has increased, and is greater than it has been during the last three years.

THE PRODUCTION OF VANILLA.

Mr. J. R. Jackson, F.L.S., has forwarded a note in connexion with the extended cultivation of vanilla that has been taking place, and its effect on future production. He points out that, as regards Réunion, the British Consul at that place reports that the overproduction of recent years has ceased. This is shown by a consideration of the following figures, which give the output for the last four seasons: 1906-7, 35,588 kilos.; 1907-8, 48,865 kilos.; 1908-9, 70,000 kilos.; 1909-10, 39,500 kilos. Mr. Jackson states, further, that prices are said to have risen considerably, so that the average for the best quality is now 29*s.* 6*d.* per kilo., as against one of 18*s.*, last year, and those of the other qualities have advanced in proportion. The result is that, as the British Consul points out, several vanilla-producing countries are limiting the output. Further information is given by Mr. Jackson, as to prices, at the vanilla auction in London, at the end of last July: Seychelles, good long, 14*s.* per lb.; common split, short, 9*s.* 9*d.*; Ceylon, fair to good, medium, 13*s.* 6*d.*; down to inferior qualities, 8*s.* 9*d.* to 11*s.* per lb.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals with The Maintenance of Soil Productivity. The subject is treated from a broad point of view, in connexion with its relation to the general agricultural prosperity, in any given country.

An interesting note, supplementing the information that has been given already on the New York Sugar Trade Laboratory, appears on page 291.

The same page gives particulars of some of the exhibits that have been sent from the West Indies to the Canadian exhibitions.

Page 293 contains an account of several of the more interesting means that are being employed to bring about improvements in agricultural methods in India.

Two articles appear under the heading Insect Notes, on page 298. These treat of the recent Brussels Congress of Entomology, and the connexion between house-flies and disease.

On page 302, the Fungus Notes contain the first of a few articles on some of the diseases of rubber trees.

Rubber plants also receive attention, on page 303, in an article which deals with the tapping of *Hevea brasiliensis.*

Publications of the Imperial Department of Agriculture.

Part I, Vol. XI, of the *West Indian Bulletin* is just being issued. The first paper in this, by Mr. F. W. South, B.A., Mycologist to the Department, deals with The Control of Scale Insects in the West Indies by Means of Fungoid Parasites. The subject is treated in three parts, of which the first gives a general account of the fungoid parasites of scale insects, while the second and third deal with the distribution of these in the Lesser Antilles, and throughout the world. The paper is illustrated by line diagrams showing various stages of the fungi. The next article is reproduced from the *Twenty Fifth Annual Report* of the Bureau of Animal Industry, United States Department of Agriculture, and treats of Epizootic Lymphangitis.

The third paper is entitled A New West Indian Cacao Pod Disease, by Mr. C. K. Bancroft, B.A., and describes a new fungus (*Colletotrichum Cradwickii*) which has been found to attack cacao pods in Jamaica. A plate containing reproductions of three blocks, prepared from photographs, serves to illustrate this paper. It is followed by an article by Mr. H. A. Ballou, M.Sc., Entomologist to the Department, in which information is given with a view to assisting in dispelling some of the confusion that exists in regard to the names of scale insects. Mr. Ballou follows this with another paper entitled Notes on Lime Cultivation, dealing with experiments carried out in Montserrat, with the aid of the Montserrat Lime Company.

As has been stated in the *Agricultural News,* experiments have been commenced at several of the Botanic Stations with a view to ascertaining the effect of planting trees in the West Indies according to the unorthodox methods in vogue at Woburn, and an account is given of the stage to which the trials have attained at several of these stations. This article is illustrated by three plates, which give a means of comparing the growth of the trees, under the different conditions of planting, in the trials in Dominica, and is followed by an account of a visit to the Guanica Central Sugar Factory, Porto Rico, by Mr. J. R. Bovell, I.S.O., Superintendent of Agriculture, Barbados, and Mr. H. A. Bovell, Barbados.

The two last papers are by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands; they give an account of Manurial Experiments with cotton in the Leeward Islands, and of The Root Development of Cotton Plants in Different Soils. The first of these describes the continuation of experiments with cotton in the Leeward Islands, accounts of which have appeared already in the *West Indian Bulletin,* Vols. VI, p. 247; VII, p. 283; and X, p. 269.

In relation to other publications of the Department, it may be stated that the annual reports on the Botanic Stations, etc., in St. Lucia and Tortola have just been issued.

Trade and Commerce of the Seychelles, 1909.

No. 643 of the *Colonial Reports—Annual*, shows that a normal crop of copra, amounting to 2,323 tons was obtained in the Seychelles during 1909. The production of guano was 17,483 tons, and there were half a million tons in reserve at the end of the year. The crop of vanilla was very short, being only 11,267 kilos., valued at Rs. 200,345 (£13,000). The quality of the cinnamon bark shipped was inferior; its quantity was 1,044 tons, and the export is likely to decrease. The high prices of copra checked the export of cocoa-nut oil, so that the amount sent away was only 1,764 hectolitres (about 39,000 gallons).

Among the remaining important agricultural products, cacao appears as a decreasing export amounting to 4,673 kilos., while a new industry, namely the production of essential oils from cloves and cinnamon has led to the shipment of 584 litres of such oils. The numbers of fruits of coco-de-mer, and of cocoa-nuts, exported, were 3,802 and 91,907.

A New Method for Felling Trees.

The *Journal of the Royal Society of Arts* for August 12, 1910, contains an abstract of an article by the Berlin correspondent of the London *Times* which deals with a simple method that has been invented for the felling of trees. This consists in cutting the trunks by the friction of a steel wire about 1 millimetre ($\frac{1}{25}$-inch) in diameter. Practical tests have shown that a tree about 20 inches thick can be cut through in six minutes.

The wire is worked to and fro by an electric motor, which may be actuated by means of a 10 h.p. petrol motor and dynamo, which are kept outside the forest. The severing action of the wire is derived from the fact that it becomes hot through friction against the tree, and actually burns its way through the timber.

The chief advantages of the method are that there is no need to insert wedges into the cut; the cut may be made immediately above or below the ground; and that large tropical trees can be felled by a single operator, with the absence of any waste of timber.

Sesbania Aculeata as a Green Manure.

Several notes have appeared recently in the *Agricultural News* (Vol. VIII, pp. 271 and 331; IX, pp. 124 and 185), dealing with *Sesbania aculeata* as a green manure. In connexion with these, Mr. R. D. Anstead, recently Agricultural Superintendent in Grenada, and now Planting Expert to the United Planters' Association of Southern India, gives the following information.

Several species of Sesbania are used in India as a green dressing for tea; among these, is dhaincha which is *S. aculeata*. The two species of Sesbania common in Southern India are *S. aculeata*, Pers., and *S. aegyptiaca*, Pers., which is being most successfully used in connexion with tea cultivation in the Wynaad. For this crop, it is sown just before the monsoon, and after three or four months, when it is about 4 feet high, it is cut down, and used as a mulch, or is turned into the soil. Mr. Anstead states that the roots of all the species are smothered with nodules in dense masses—more so than in any other plant that he has seen.

It may be mentioned that it was stated in the *Agricultural News*, Vol. VIII, p. 271, that *S. aculeata* occurs in many islands in the West Indies, and that a description of it was given. *S. aegyptiaca* is also found in this part of the world: it is an under shrub, with leaves provided with many leaflets, and with yellow flowers in which the standard is dotted with purple; the pod is swollen at intervals along its length, and attains a size of 5 to 7 inches.

As has been suggested before, observations and experiments with the different species of Sesbania in the West Indies would be of much interest, especially in relation to their possible adoption as plants for green dressings.

The Blackbird of Dominica.

This is the same as the tick bird of several of the West Indian islands (*Crotophaga ani*); it is quite different from the blackbird of Barbados (*Quiscalus fortirostris*).

Enquiries have been made recently by Mr. J. Jones, Curator of the Dominica Botanic Station, as to whether the blackbird is regarded by planters in that island as being of any value in reducing the number of insect pests. It is the general opinion that the bird is not harmful as it lives largely on grasshoppers and other insects. In one case, it was stated that the birds had been observed to pick the ticks from cattle; there was, however, the more general idea that they do not remove the ticks, but accompany the cattle because their movements in the long grass cause the grasshoppers to rise, and thus to be easily caught by the birds.

This evidence as to the feeding habits of the Dominica blackbird is supported by the circumstance that the gizzards of three of them that were shot recently were found to contain grasshoppers, crickets and numerous seeds of a native bush.

The Rubber Industry of Brazil.

The *Board of Trade Journal* for August 4, 1910, gives information concerning the rubber industry of Brazil, which has been furnished by H.M. Legation in that country. This shows that the exports of rubber, during 1909, amounted to about 39,000 tons, valued at £18,926,061, while in 1908 they were about 38,206 tons, valued at £11,784,637.

It is supposed that, when rubber commences to be collected from the territory that has been recently secured by treaty from Peru, and when the means of communication have been improved by the Madeira-Mamore Railway, there will be a large increase in the production.

Notwithstanding the fact that the supply of rubber in Brazil appears to be almost inexhaustible, the responsible authorities seem to be fully alive to the harm that may accrue from the industry by the competition of plantation rubber, and by wasteful methods of collection. This is shown by the fact that they are at present encouraging the laying out of plantations, and are granting various privileges to cultivators.

INSECT NOTES.

THE BRUSSELS CONGRESS OF ENTOMOLOGY.

An account of the proceedings of this Congress is contained in the London *Times* of August 10, 1910, from which the particulars in the following article are taken

The Congress was held from August 1 to 6, and included a membership of 292, of which sixty-seven representatives were from British Institutions, or were British private individuals. The Imperial Department of Agriculture for the West Indies was represented by its late Commissioner, Sir Daniel Morris, K.C.M.G.

In relation to the spread of disease by insects, Dr. R. Blanchard, of Paris, gave a lecture on Medical Entomology, in which special attention was drawn to the large part played by insects, especially in the tropics, in the distribution of disease. The lecturer dealt chiefly with the Anophelinae and malaria, *Stegomyia fasciata* and yellow fever, *Glossina* spp. and sleeping sickness (trypanosomiasis). In connexion with the last-mentioned of these, reference was made to the death of Lieut. Tulloch, of the Army Medical Department, which was caused by his being attacked by it when engaged in investigations on it in West Africa. A matter of particular interest is that definite relationship between these diseases and the insects which carry them, makes the study of the latter a subject for inclusion in the realm of practical medicine

Several papers serve to illustrate the intimate connexion that exists between entomology and agriculture. The first of these was read by Sir Daniel Morris; it dealt with the methods that are employed in the West Indies to prevent the importation of insect pests into the various islands, with special reference to the legislation in connexion with this. An account of the work of this kind which has been done will be found in the *West Indian Bulletin*, Vol. X, p. 197. An instructive description was given by Dr. G. H. Carpenter, of the Royal College of Science, Dublin, of the warble fly (*Hypoderma bovis*) which lays its eggs on cattle, so that grubs are produced which enter the flesh and render it unfit for food. (See *Agricultural News*, Vol. VIII, p. 170.) The conclusion reached, so far, was that the washes which have been suggested for employment against this pest are useless for the purpose of its control. Dr. R. S. MacDougall, of Edinburgh University, gave an account of the damage that is done by a small beetle, *Galerucella lineola*, to the osier beds in the Midland and Western Counties of England. Arsenical sprays have been found effective against this, where the smaller-sized plants are attacked.

Numerous and interesting papers dealing with subjects connected with pure entomology included those on ants and their guests, and mimicry; and an account was given of a recent Swedish entomological expedition to Kilimandjaro, the results of which have been many and interesting.

On the last day of the Congress, papers were read on general subjects. In one of these, Mr. J. N. Howlett, F.E.S., of the Imperial Agricultural Research Institute, Pusa, described the difficulties of keeping collections of insects in climates where there are sudden changes of temperature and humidity, and came to the conclusion that specimens could only be protected, under such circumstances, from the damage done by mites and moulds, by continual careful attention. Dr. H. Skinner, an American delegate, gave a brief account of the history of entomology in the United States during the last 100 years, insisting upon the great value that entomological work had already shown, in reference to agriculture especially, in that country.

At the final general meeting, an invitation was given for the next congress to be held at Oxford, in 1912, and the acceptance of this was agreed upon.

HOUSE-FLIES AND DISEASE.

A valuable article with the above title appears in *Nature* for July 21, 1910. This deals, firstly, with the history of the association of unhealthy conditions with flies, pointing out that in 1871, Lord Avebury described flies as 'winged sponges spreading hither and thither to carry out the foul behests of contagion'. Before this, it had been shown that the house-fly and and the blow-fly were capable of transmitting the anthrax bacillus, and in 1873 the possible dissemination of cholera by flies was indicated. Laveran showed, in 1880, that flies were able to carry the infectious discharge from a disease of the eyes known as conjunctivitis, in Egypt. The chief progress in the matter has, however, been made since 1886, when the micro-organism causing cholera was obtained from flies caught in wards where cases of that disease were being treated. In the same year, the micro-organism of consumption (tuberculosis) was found in the excreta of flies from a room which had previously contained a sufferer from the disease. In 1888, the important observation was made that the typhoid bacillus was able to pass, in a condition in which it was capable of producing the disease, through the digestive organs of the fly.

The article proceeds to a consideration of the incidence of typhoid and enteric fever during the Spanish-American and the South African wars, showing that, under the conditions of sanitation of the camps, the spread of these diseases is easily explained in the light of what is known about the habits of the house-fly. The observation is made that, although the insect may be almost sterile, that is free from micro-organisms, when it emerges from the pupal case, yet it quickly picks up infectious living matter. Evidence in support of this is adduced by means of some experiments by Güssow, which have not been published so far. In one of these, thirty colonies comprising six species of bacteria, and six colonies comprising four species of fungi were obtained from a single fly, which was caught in the living room of a house and allowed to walk over the surface of material on which the organisms could develop. In another, forty-six colonies comprising eight species of bacteria, and seven colonies comprising four species of fungi, were obtained in the same way from a fly caught in the open. Finally, a house-fly caught in a household dust-bin yielded similarly 116 colonies of bacteria comprising eleven species, some of which were capable of producing disease, and ten colonies comprising six species of fungi.

The eggs of the house-fly are laid preferably on horse manure. The likelihood, however, of their being deposited on almost any kind of filth makes it easy to see what a potent factor the insects may become in relation to the transmission of disease. This is of special importance in view of a recent discovery by Faichne, to the effect that larvae developed in infected material produce flies which may carry the typhoid bacilli in their digestive organs, and that these bacilli may retain their power of causing the disease for more than three weeks.

The article concludes with an expression of the importance of flies as factors in the dissemination of disease, and points out that, although these insects cannot be eradicated from any given district, yet measures for their control, by preventing their breeding as far as possible, are quite practicable, and that the usefulness of these is bound to attain a larger amount of realization in the future.

OUR BOOK SHELF. NOTES and REVIEWS.

A HANDBOOK OF THE FUNGUS DISEASES OF WEST INDIAN PLANTS, By Keith Bancroft, B.A. *Geo. Pulman & Sons, Ltd., London.*

This book, as its name indicates, contains, in a small compass, a short account of each of the diseases of plants grown in the West Indies, more especially of those which are of economic importance. The diseases are arranged according to the systematic classification of the fungi causing them, and not under the names of the various host plants. This does not, however, in any way detract from the value of the book to the practical agriculturist, as a complete index is provided containing, in addition to the names of the causative fungi, the popular names of all the host plants, and of the several diseases to which each is subject. In the case of all the more important of these, the account contains a careful description of the field symptoms, an outline of the treatment to be followed, a technical diagnosis of the fungus, and one or more references to papers dealing with it. A few points of historical interest also appear.

One feature of the introduction is a table showing the geographical distribution of the principal fungi parasitic on sugar-cane and cacao. There will also be found in it a short account of various methods of treatment for disease, and observations on one or two points requiring attention. The first of these is in connexion with cacao canker, on which subject considerable light has been shed by Mr. Rorer, in his papers in two recent numbers of the *Bulletin of the Agricultural Department*, Trinidad, Vol. IX, pp. 38 and 79; these accounts were unfortunately not issued until after Mr. Bancroft's book was printed. A second point is the nomenclature of the fungus causing die-back and brown rot of cacao, and its possible identity with that found on cocoa-nuts and on Hevea, as well as on several other host plants. After a general review of the position, Mr. Bancroft has retained the old name, *Diplodia cacaoicola*, particularly as it helps to avoid confusion. The discovery of a Fusarium stage in its life-history is a matter of interest, as such a form is often found on diseased cacao, associated with *Diplodia cacaoicola*. A third point is the possible identity of *Thielaviopsis ethaceticus*, the pine-apple disease fungus of sugar-cane, with a stage in the life-history of *Trichosphaeria sacchari*, the rind fungus. In connexion with this, it may be pointed out that the growing opinion appears to be that the former is an independent organism, though this point cannot be said to be definitely settled.

It will be noted that, in many ways, this book closely resembles a paper by the same author, published in the *West Indian Bulletin*, Vol. X, p. 235. There are, however, certain points of difference. In the first place, the book contains accounts of some of the more important fungi found on various host plants in other parts of the tropical world; these are introduced naturally in connexion either with crops well known in the West Indies, or with genera of fungi, several of whose species are of wide-spread economic importance. The addition of these accounts, and the six good plates at the end, add considerably to its value from a mycologist's point of view. The contents of the book also differ from the paper referred to, in that another system of classification has been employed throughout. Among other, minor, points, it may be mentioned that Mr. Bancroft attributes angular leaf spot of cotton to physiological causes, and not to *Bacillus malvacearum*. It is not easy to understand the reason for this, especially as he unfortunately gives no references, in this instance. It may also be pointed out that several authorities in America are inclined to attribute foot rot, or mal-di-gomma, of citrus trees rather to physiological causes than to *Fusarium limonis*, as is done in the work under review. Again, no mention is made of the difficulties with regard to the bud rot disease of the cocoa-nut palm, the Indian form attributed by Butler to *Pythium palmivorum* being regarded by some authors as probably identical with that found in the West Indies and with that in Ceylon. The cause of the disease in the last two places is not as yet definitely known, but there is a growing tendency to regard it as of bacterial origin. It is also to be regretted that Mr. Bancroft did not see fit to include an account of thread blights on cacao and mangos, or of the well-known root disease of cacao, usually referred to in Trinidad as the brown root disease; for although the fungi inducing these are not definitely identified, some account of their appearance would have been useful.

These matters are, however, comparatively unimportant. On the whole, the book contains a most useful account of the main fungoid troubles against which agriculturists in the West Indies have to contend; and everyone engaged in raising crops on a large scale would do well to possess a copy.

BRAZIL IN 1910, By J. C. Oakenfull. *Published by the Author at St. Budeaux, Devonport.*

This book, which seems to form a very complete guide to Brazil, is edited by the Commission of Economic Expansion of Brazil, Paris. It contains 280 pages of matter, which deals, in order, with the general natural features of the country (Chapters I to III); its economic conditions, in history and at the present time (Chapters IV to VIII); particulars of its natural history and products, both vegetable and mineral (Chapters IX to XIX); art and literature (Chapter XX). The main portion of the book is followed by an appendix, containing in six parts, information such as will be of more particular use to the immigrant, and relating to salaries and cost of living; customs tariffs; details as to industries and production; bibliography; terms used in mineralogy; and the arrangements for the reception of immigrants. It should be understood that this description of the contents of the volume only forms a very broad outline, and that many sub-heads are included under the above designations, each of which receives thorough treatment.

The most useful part of the book to anyone who may be studying the conditions in Brazil with a view to taking up residence in that country is comprised in Chapters VIII to XVIII, and in the appendix. In this part, as throughout, it is well produced, with good illustrations; although there are a few typographical errors, especially in regard to scientific names. It can be recommended to all who desire to know anything about Brazil, whether they are thinking of visiting that country, or not.

GLEANINGS.

The condition of the cacao crop in Grenada has been good, and record yields have been obtained on every estate during this season. Some pickings were obtained even as late as last month.

It is announced that the following machinery is at present for sale in the island of St. Martin: 1 Crossley L.L. oil engine of $4\frac{3}{4}$ h.p., and 1 roller gin, by Platt Bros. Enquiries in connexion with these should be addressed to Mr. C. Chittick, Nevis.

A report received from the Superintendent of Agriculture, Barbados, shows that the present cotton crop is making favourable progress. Caterpillars have appeared in certain places, but have been promptly kept in check by means of Paris green and lime.

With reference to a note on p. 268 of the current volume of the *Agricultural News*, stating that rain was required for the cotton crop in the windward districts of Montserrat, it is of interest that generally good rains have fallen since that time, so that the crop is promising throughout the island.

An article in *Nature* for June 16, 1910, entitled Goats and Malta Fever, gives an account of this disease, and points out the special danger in regard to infection that arises from the fact that goats suffering from it do not give any evidence of ill-health, nor do they show a body temperature above the normal.

The *Experiment Station Record* of the United States Department of Agriculture makes a note of investigations undertaken with cassava flour in France, in which a sample of this, which was sold as a food for animals, was found to contain 0·0041 per cent. of hydrocyanic acid—the poisonous principle of cassava.

Information has been received from St. Kitts that the growth of the sugar-cane has much improved, during August, in consequence of the increased rainfall; nevertheless, the crop is still backward for the time of the year. The condition of the cotton crop is good everywhere, and cotton from the May plantings is already being picked on several estates.

It is announced that the following sheep are for sale in Barbados: the West African ram sheep 'Alaki', imported by the Imperial Department of Agriculture, and four Barbados ewes, in lamb for that sheep. Enquiries in connexion with these should be made to Mr. F. C. Bancroft, Moonshine Hall, St. George, Barbados.

A copy of the colour chart issued by the French Chrysanthemum Society, and described in the *Journal of the Royal Horticultural Society* for March 1910, has been acquired for the use of this Department. It should be especially valuable in connexion with the description of the parts of plants in relation to classification, or in breeding experiments.

With reference to past notes in the *Agricultural News* (Vol. IX, pp. 188 and 277) concerning the Manchurian soy bean industry, it is of interest that, according to the *Board of Trade Journal* for August 11, 1910, several important Japanese firms are considering the feasibility of establishing a soy bean exchange at Dairen, for the purpose of putting the trade on a sound basis.

According to a recent advertisement in the *Port-of-Spain Gazette*, the Board of Agriculture of Trinidad has approved of an expenditure of £200 for the encouragement of good cacao cultivation by peasant proprietors or contractors. For the first year, two centres will be selected for prizes, and these will be awarded in two classes, namely for holdings above 5 and not exceeding 10 acres, and for holdings not exceeding 5 acres in area. In both cases, in the event of their being earned, five prizes will be given, ranging in value from £2 10*s.* to £20.

The *Colonial Reports—Annual*, No. 640, states that rubber, cacao, kola nuts, gum copal and ivory continue to be the principal exports of Ashanti. According to the same source, the export of rubber from that country has risen from 536 tons in 1908 to 1,319 tons in 1909. The increase was mainly due to high prices; these ranged from 1*s.* 1*d.* to 2*s.* $2\frac{1}{2}$*d.* per lb., although the average for the year was as much as 1*s.* 10*d.* per lb. This means that the amount obtained for rubber in 1909 was £270,000, as against £90,000 for 1908.

It has been stated for general information that there is for sale, near the seashore at Soufrière, St. Lucia, a sugar-cane mill, manufactured by John Musgrave, Lancashire, England, which contains three rollers, 3 feet 3 inches in length, and having a diameter of 22 inches. The mill is arranged for operation by water power, and for this purpose an overshot wheel 27 inches in diameter is provided. All the fittings are intact and in good order, and include cane and megass tables. Offers for the purchase of the mill should be addressed to the Chief Clerk, Government Office, Castries, St. Lucia, and the purchase money must be paid before the mill is removed.

In connexion with the note in the *Agricultural News*, p. 220 of the present volume, stating that the *India Rubber Journal* was presenting a shield, value 100 guineas, for the best sample of Plantation Para Rubber shown at the International Rubber and Allied Trades Exhibition, 1911, information has been received from Mr. A. Staines Manders, organizing manager of the exhibition, as to the rules of the competition. These show, among other things, that samples must weigh not less than 10 lb.; they must have been produced solely upon the property of the exhibitor; and that entries for the competition must reach the Award Committee of the Exhibition by the night of May 1, 1911.

STUDENTS' CORNER.

SEPTEMBER.

SECOND PERIOD.

Seasonal Notes.

Leguminous and other plants are being grown, during the present time, on the land which will be used subsequently for the cultivation of main crops. Reference has been made several times to the particular usefulness of leguminous plants, in this connexion, on account of the property which they possess of harbouring nodule-forming bacteria that take nitrogen from the air and hand it on to them in such a form that they can make use of it. An important fact necessary to understand, in relation to these minute organisms, is that they usually exist in most soils, but that there are several varieties of them, each of which acts in conjunction with a definite plant. This explains why the first few crops of a leguminous plant that has been introduced newly into a country are often small, even though the conditions of climate are suited to it. Fortunately, the bacteria, as they complete several generations in a short time, quickly show changes in their characteristics when the conditions under which they are living are altered. In other words, the number of generations that are necessary for any definite results of evolution to show themselves are speedily completed, so that different varieties are soon obtained. This is fortunate, because it gives a means of providing a suitable variety of nodule-forming bacteria where new leguminous plants are introduced where this does not occur already. This means is simply to grow several crops of the new plant in the same soil, one after the other, when, if this soil contains any nodule-forming bacteria at all, there is a likelihood that these will change their characteristics in such a way as to become useful to the new plant. The process can be extended eventually, by scattering some of this soil over other areas where the plant is to be raised, thus sowing it with the right kind of bacteria. Attempts have been made, as is well known, to form cultures of the nodule-forming bacteria, so that they may be sent where they are required on account of the absence of the organisms from the soil. By making cultures is meant getting the bacteria from the nodules on the roots of the leguminous plants, separating them from other living organisms that may be present, and giving them the best chance of increasing their numbers by supplying them with suitable food. This is a comparatively simple matter; the great difficulty arises when it is attempted to prepare these cultures in such a way as to enable the bacteria to be sent long distances, and to arrive still living; no particular success has been obtained, so far, with such artificial methods of preparation.

Make observations, as far as you can, on the effect on the succeeding crop of the employment of green dressings. Give a list of all the ways in which such dressings may be beneficial to the soil. Discuss the advisability of employing these where the rainfall is small.

Consider, as far as you can, the direct effect of too great and too little rainfall on the parts of plants above the ground. How is the amount of rainfall, during the chief period of flowering of cacao directly related, for instance, to the number of pods that will be borne? Remember that rainfall has to be considered not only in reference to the condition of the soil, but to effects of the kind just mentioned, and to the influeuce that it has on insect life. The last consideration is especially important in relation to cotton. What connexion exists between the precipitation and the amount of shade to be provided, where this is necessary? Give an account of the life-processes of the plant that are bound up intimately with the matters brought forward by this question.

In going through a cacao plantation, it is noticed that some of the pods on a few of the trees in a small area show round, brown patches; in other cases, the brown colouration has spread all over the surface of the pod; while in the worst instances, the rind, beans and pulp have been destroyed. What reason would you give for these appearances of the pods, and what suggestions would you make, in order to lessen the chances that other healthy parts of the plantation shall suffer loss in a similar way?

Give an account of the life-history of the honey bee, comparing it in a broad, general way with that of the ant. What are the chief circumstances to be taken into consideration when the advisability of keeping bees is under notice?

Provide a description of the arrangement of an apiary to suit the conditions surrounding the place where you live. Mention any ways in which bees are useful to agriculturists.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State whether it best to obtain cuttings for planting sweet potatos from those grown from cuttings or from roots.

(2) Explain why good drainage of the soil is necessary to the successful growth of crops.

(3) Give as many reasons as you can for propagating plants by grafting.

INTERMEDIATE QUESTIONS.

(1) Discuss the advantages and disadvantages of the presence, to any extent, of stones in a soil.

(2) Mention how the cells of the vegetatively growing parts of plants are increased in number.

(3) State how observations on a germinating cotton seed may give indications as to the best conditions for its sowing on a large scale.

FINAL QUESTIONS.

(1) Give an account of the chief points that merit consideration when the suitability of a given piece of land for cacao cultivation is being decided.

(2) In relation to the employment of artificial manures for maintaining soil fertility, what possible alternatives exist, and why are they limited in their application?

(3) Give your idea as to the most advantageous arrangement of the various buildings on a lime plantation producing concentrated juice in fire-heated pans.

The *Journal of the Board of Agriculture* for August 1910, p. 412, gives an account of a new type of milk-preserving machine that was exhibited at the Bordeaux Agricultural Show in May 1910. The principle employed in the machine is the exposure of the milk to a very high pressure, with subseqent pasteurization, so that the fat globules are crushed and mixed so completely with the water in the milk that they cannot be separated, and it is consequently impossible to obtain cream from such milk. Its great advantage, however, is that it will keep in bottles for an indefinite length of time.

FUNGUS NOTES.

SOME DISEASES OF RUBBER TREES.

PART I.

As mention has been made, in recent numbers of the *Agricultural News*, of one or two diseases of Hevea, and as the cultivation of this plant, as well as of Castilloa, has been introduced into some of the islands, it is thought that a summary of the diseases to which rubber trees are subject in the different parts of the world in which they are grown, more particularly the far East, may prove of some interest to readers. One peculiarity of the majority of these complaints is their close similarity to those commonly found affecting cacao. Not only are the external symptoms much alike on both hosts, in several cases, but the causative fungi of the disease on each are often closely related species, even if not actually identical. There is also a connexion, in one or two cases, particularly with regard to root disease, between the species of fungi found on Hevea and those on cocoa-nut palms; moreover, some of these on the former host plant also attack tea, coffee, mangos, and certain other plants of economic importance.

ROOT DISEASES. Two different important root diseases affecting rubber plants are known, and one or two others have been recorded as being occasionally found. To what extent the minor ones are identifiable with one another or with known diseases of other host plants is not yet definitely known, as the fructifications of the causative fungi have not been found.

The best known root disease is probably that due to *Fomes semitostus*, Berk., which occurs in Ceylon and the Federated Malay States. The fungus belongs to the order Polyporaceae, of the Hymenomycetineae. It attacks the main root, or some of the lateral roots, of trees between the ages of fifteen months and four years. In some instances in Ceylon, the first indication of the diseased condition of the roots was given when the trees were blown down by a high wind; it was then found that the main root was destroyed, having been eaten through by white ants, which had followed the attack of the fungus. Strong lateral roots had been developed, which served to supply the trees with moisture, but these were not strong enough to enable them to resist the wind. More generally, however, the first symptoms are the browning of the leaves round the edges and at the tips, owing to the ringing of the main root by the fungus, which thus stops the water supply. Three days later, the trees are completely dead. No latex will flow if the stem is wounded, and in some cases the leaves fall off. More usually, however, the tree is blown down before this happens, especially if the roots have been eaten by white ants. The fungus forms a whitish, cobweb-like felt on the main root, and white strands, or cords, on the lateral roots; these cords, when older, frequently become straw-coloured. The roots appear black, the cortex is soft and rotten, and no latex flows when it is cut. The wood is discoloured, usually being turned brown. Fructifications only appear on trees which have been dead some time, or on jungle stumps. They are of a bracket shape, and occur just above the ground level; their upper surfaces are orange, or maroon-coloured, while the under ones are of different shades of brown, being orange-coloured only when quite young. The spores of the fungus can, apparently, only germinate on dead stumps, and it is from these that the rubber trees are affected. This accounts for the limitations in the age of the hosts attacked, as, if the roots have not come into contact with diseased jungle remains before the tree is four years old, subsequent infection is unlikely. Although the infection always appears to occur in this way, the mycelium from these stumps is capable of direct parasitism, and does not require the presence of wounds to enable it to attack its host. The remedial measures recommended are the usual treatment for root diseases, combined with the removal of all decaying stumps and roots from those areas which are known to be infected. References to this disease are: *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. III, p. 237; Root Disease of Hevea Brasiliensis, Petch; Bulletin No. 2 of the Department of Agriculture of the Federated Malay States, Gallagher; *Ceylon Administration Reports* 1905 and 1906, Petch; *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. III, p. 174, Ridley, with short notes in other volumes of the same publication. In connexion with this fungus, it is interesting to note that a white sterile mycelium has been found to attack the roots of both Hevea and Castilloa in Java, and that it is described by Dr. Bernard in Bulletin XII du Département de l'Agriculture aux Indes Néerlandaises.

The second important form is that known as brown root disease. The external symptoms are very similar to those existing in the case of the first one, but on examining the attacked parts, it is found that they are surrounded by a mass of earth and stones so firmly bound on to them by a fungus mycelium that they cannot be cleaned by washing. This mass forms a felt of a white or yellow-brown colour which is apparently fairly characteristic of the disease. No fructifications have been observed, but the fungus in Ceylon is believed to be identical with a form provisionally referred to the genus Hymenochaete, found on cacao in Samoa, and with that referred to as *Sporotrichum* sp. on cacao in Java. It attacks cacao, Hevea, Castilloa, tea, Caravonica cotton and dadap (*Erythrina* spp.) in Ceylon, and also occurs in the Federated Malay States. Petch, in the *Ceylon Administration Reports* for 1906, thinks it identical with a fungus known as *Irpex flavus*, Klotsch, which attacks coffee, and Ridley describes a fungus which he also believes to be *Irpex flavus* on Hevea, in the Malay States. (*Agricultural Bulletin of the Straits and Federated Malay States*, Vol. V, p. 64.) The coffee fungus was known to occur in the Malay States, and the Hevea disease from the same locality is very similar; it also resembles a disease attacking clove trees in Malacca. *Irpex flavus* is reported, as well, from Java, Queensland, and North America. The remedial measures against brown root disease are the same as in the case of *Fomes semitostus*.

In one instance, a root fungus with a white mycelium produced fructifications recognized by Petch as *Poria vincta*, B. and Br. (*Ceylon Administration Reports*, 1905). Recently, a fungus on cacao and Hevea in Apia has been described by Dr. Funk as *Hymenochaete noxia*, Henning, and may be identical with the Ceylon brown root disease, though this is uncertain. A fungus also identified as *Hymenochaete noxia* causes a disease of cacao in West Africa. These two fungi conclude the list of parasites found on the roots.

To summarize, then, there are two important root diseases of Hevea. The first is found in Ceylon and in the Federated Malay States, and is due to *Fomes semitostus*, whose mycelium is characterized by the formation of white or straw-coloured cords on the lateral roots. The second occurs on Hevea and Castilloa, in Ceylon and in the Malay States, and may be designated the brown root disease. It is characterized by forming a light brown felt of mycelium mixed up with earth and stones, around the roots attacked. A fungus similar to *Irpex flavus* is described from the Federated Malay States, and is possibly the same as the brown root disease fungus. Another form, identified as

Hymenochaete noxia, has been found on rubber and cacao in Apia, and one known as *Poria vincta* in Ceylon. An unidentified white mycelium occurs on Hevea and Castilloa in Java. Nearly all the forms, but particularly the first two, commence their growth on old forest stumps, from which they spread to the cultivated plants.

Before closing this portion of the subject, reference must be made to a disease of Castilloa trees which occurs in Ceylon (Petch. *Tropical Agriculturist*, Vol. XXVII, p. 86). This disease resembles the foot rot of orange trees. An open wound appears at the collar, and extends upwards along the stem, and downwards over the roots. The disease is due to a species of Fusarium which appears as small white tufts issuing from cracks in the apparently healthy bark. It is encouraged by excessive shade or bad drainage, as is the orange tree disease, which has also been attributed to *Fusarium* sp. The remedial measures are the same as those usually recommended for foot rot. (See *Agricultural News*, Vol. VIII, p. 248.)

This article will be followed by one, in the next number of the *Agricultural News*, in which it is intended to deal with the diseases occurring on the stem, leaves and fruits of rubber plants

TAPPING PARA RUBBER TREES.

Bulletin No. 10 of the Department of Agriculture of the Federated Malay States has been issued recently under the title of *A Lecture on the Para Rubber Tree*, by W. J. Gallagher, M.A., Director of Agriculture. From this the following extracts are taken:—

BEST KIND OF TAPPING. Tapping one quarter at one time is certainly the best for the tree. The renewal will be better, and from actual experience I am inclined to infer the flow will be better. I do not quite see why one quarter tapped over one year should not be followed instead of two quarters tapped over two years. The former has much to recommend it, and is, I believe, the system of the future. We know there is a limit to the closeness of cuts, and to the number which may be put on a tree, and this may, in a three years' renewal system, make the single quarter undesirable.

The full herring-bone system is occasionally varied by tapping three months on one half, resting two; then three on the other half, followed by two months' rest, and back again for three months to the first side tapped. This is undoubtedly wasteful. Every time a change is made, each cut must be tapped at least three times before a normal flow of latex begins. With a tapping force of 300 coolies, this is a loss of 1,800 names in ten months.

MARKING OUT TREES. Unless you have your trees marked out on a definite system, you can hardly hope to have good tapping. I still find, on otherwise well managed estates, that on the same tree, bark of three different ages is being tapped. At best, this must be slow work, and only a good coolie can do it well. There is no longer an excuse for a man to tell you his cuts are the length of the knife apart, and he expects them to last seven or eight months.

Nobody can say if the system of to-day will be the system of next year, but this is no reason why you should not have a system.

The factors to be considered are:—

1. Time for renewal.
2. Number of tapping days per year.
3. Number of cuts to the inch.

The accumulation of experience shows that the first should be put down at four years. On the one half herring-bone system one quarter must be finished in one year, and in 350 or 175 days tapping, according as every day or alternate day tapping is followed; fifteen days at least must be allowed for holidays, breakdowns of machinery, rain and other unforeseen difficulties.

NUMBER OF CUTS TO THE INCH. It is a matter of experience that more latex per cut is obtained when the coolie does twenty five cuts to the inch than when he does fifteen, with the advantages in the former case that there is (a) only three-fifths of the bark to be renewed for the same tapping period, and (b) at least 60 per cent. more latex obtained from equal areas. I believe it will pay better to try to increase the number of cuts to the inch, rather than to emphasize going in close to the cambium, though both should of course be done. Twenty cuts to the inch may be considered as the minimum to be obtained. Anything less than this indicates, to my mind, a fault somewhere in management and supervision. Twenty-three may be considered as average, and twenty-five or over as very good.

DISTANCES TO PUT CUTS APART. Hence with twenty cuts to the inch and alternate day tapping on a system in which only one quarter is completely tapped in one year, the cuts should be 175 (days) $\div$ 20 (cuts) $= 8\frac{1}{2}$ inches apart. That is, the number of tapping days in the period of time you want the quarter of the tree to last is divided by the number of cuts you can get into the inch.

If every day tapping is followed, the cuts should be 350 (days) $\div$ 20 (cuts) $= 17\frac{1}{2}$ inches apart.

I may say here that a system in which the cuts are $8\frac{1}{4}$ inches apart should not be followed. The cuts will become dry after a few months tapping.

Where adjacent or opposite quarters are tapped on an allowance of four years for renewal, the cuts should be: with alternate day tapping 2×175 (days) $\div$ 20 (cuts) $= 17\frac{1}{2}$ inches apart, every day tapping 2×330 (days) $\div$ 20 (cuts) $= 35$ inches apart.

The above distances do not consider 'resting'; where a manager decides to 'rest', he will have fewer tapping days in the year, and his cuts will be proportionately closer.

Having decided how far apart the cuts should be, the next thing is to mark out the tree by vertical lines into quarters.

The 'inner' lines to conduct the latex should not be deeper or wider than is necessary for their purpose. The outer guiding lines should be as shallow and as narrow as possible; they should be just distinct enough to mark clearly the boundaries of the cuts. When the vertical lines are too deep, the lateral passage of building material into the area between the cuts is interfered with. The cuts should be marked off parallel to each other, and always kept parallel. The tendency of the coolie to cut away more at the end of the cut next to the main channel must be repressed. Every cut must be carried out to end bluntly at the outer edges of the guiding lines. Too often, the cut is seen to get gradually shallower, and about $\frac{1}{10}$-inch is lost at each end, which, when totalled for a coolie's daily task, will be found to be equivalent to two or three trees; and the loss is greater than this, for the labour of cutting the area is done imperfectly.

The coolie should be provided with a stick on which inches are marked; he should be made clearly to understand that the distance of an inch must last him twenty-five days, or whatever number of cuts to the inch the manager is content to get.

The information given regarding the tapping of young trees, distances for planting, thinning out, topping trees, and pruning, will be reproduced in the next number of the *Agricultural News*.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 30, 1910; Messrs. E. A. DE PASS & Co., August 19, 1910.

ARROWROOT—St. Vincent, 1⅞d. to 2$\frac{1}{16}$d.
BALATA—Sheet, 3/5; block, 2/6 per lb.
BEESWAX—£7 5s. to £7 12s 6d.
CACAO—Trinidad, 52/- to 62/- per cwt.; Grenada, 48/- to 52/6; Jamaica, 47/- to 52/-.
COFFEE—Jamaica, 40/- to 92/-.
COPRA—West Indian, £27 to £27 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 59/- to 65/-.
HONEY—24/6 to 25/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/- to 1/1; concentrated, £18 2s. 6d. to £18 10s.; Otto of limes (hand pressed), 5/9 to 6/-, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Steady.
PIMENTO—Common, 2⅛d.; fair, 2¼d.; good, 2⅜d. per lb.
RUBBER—Para, fine hard, 8/3, fine soft, 7/3; fine Peru, 8/- per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 17/- to 19/6; Muscovado, 13/- to 15/-; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., September 2, 1910.

CACAO—Caracas, 10¾c. to 11½c.; Grenada, 10¾c. to 11c.; Trinidad, 10¾c. to 11¼c.; Jamaica, 9c. to 11c. per lb.
COCOA-NUTS—Jamaica, select, $34·00 to $36·00; culls, $18·00 to $19·00; Trinidad, select, $34·00 to $36·00; culls, $18·00 to $19·00 per M.
COFFEE—Jamaica, ordinary, 10c. to 10¼c.; good ordinary, 10¾c.; and washed, up to 12c. per lb.
GINGER—8¾c. to 11c. per lb.
GOAT SKINS—Jamaica, 56c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—$3·50 per box.
LIMES—$6·00 to $7·00.
MACE—35c. to 40c. per lb.
NUTMEGS—110's, 8¾c. to 9c. per lb.
ORANGES—Jamaica, $2·25 to $2·50 per box.
PIMENTO—4¼c. per lb.
SUGAR—Centrifugals, 96°, 4·42½c. per lb.; Muscovados, 89°, 3·92½c.; Molasses, 89°, 3·67½c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., September 3, 1910.

CACAO—Venezuelan, $11·25 per fanega; Trinidad, $11·00 to $11·25.
COCOA-NUT OIL—$1·12 per Imperial gallon.
COFFEE—Venezuelan, 10¾c. per lb.
COPRA—$4·80 per 100 lb.
DHAL—$4·20 to $4·25.
ONIONS—$2·40 to $2·50 per 100 lb.
PEAS, SPLIT—$5·90 to $6·00 per bag.
POTATOS—English, $2·00 to $2·10 per 100 lb.
RICE—Yellow, $4·70 to $4·75; White, $5·25 to $5·30 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., September 10, 1910; Messrs. T. S. GARRAWAY & Co., September 13, 1910; Messrs. JAMES A. LYNCH & Co., September 5, 1910.

ARROWROOT—St. Vincent, $3·75 per 100 lb.
CACAO—$10·50 to $12·00 per 100 lb.
COCOA-NUTS—$21·00.
COFFEE—Jamaica and ordinary Rio, $10·00 to $11·50 per 100 lb., scarce.
HAY—$1·20 to $1·40 per 100 lb., dull.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $3·00 per 100 lb.
PEAS, SPLIT—$6·00 to $6·25 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
POTATOS—Nova Scotia, $3·00 to $3·25 per 160 lb.
RICE—Ballam, no quotations; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, September 3, 1910; Messrs. SANDBACH, PARKER & Co., September 2, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·50 to $8·00 per 200 lb.	$7·50 to $8·00 per 200 lb., mkt. dull
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	80c.	No quotation
CASSAVA STARCH—	None	No quotation
COCOA-NUTS—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	$3·65 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$4·60	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		——
Madeira	2¼c. to 2½c.	2½c.
PEAS—Split	$6·00 per bag (210 lb.)	$5·75 to $6·00 per bag (210 lb.)
Marseilles	$4·25	No quotation
PLANTAINS—	40c. per bunch	——
POTATOS—Nova Scotia	None	$3·00 to $3·25
Lisbon		No quotation
POTATOS—Sweet, Barbados	$1·80 per bag	——
RICE—Ballam	None	——
Creole	$5·00 to $5·20	$5·00 to $5·20
TANNIAS—	$1·92 to $2·00 per bag	——
YAMS—White	$3·00	——
Buck	$3·00	——
SUGAR—Dark crystals	$2·80 to $3·00	None
Yellow	$3·25 to $3·50	$3·70
White	$4·00 to $4·10	$4·00 to $4·25
Molasses	$2·25 to $2·60	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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CONTENTS.

The Use of Electricity in Agriculture.

THE employment of electricity on the farm and estate as a form of energy, and the use, under the same circumstances, of substances produced by its means, are rapidly increasing in extent. This is chiefly on account of the ease with which it may be employed, and because of the cheapness of its production, especially where there exist natural sources of energy, such as waterfalls. The extension of the use of electricity in agriculture is dealt with in a recent publication*, from which some of the following facts are more directly collected.

One of the most obvious ways of using electricity in the production of plants was suggested after the discovery of the arc lamp. This consists in stimulating the growth by keeping the plants under a very powerful red light, or, on the contrary, retarding it under a green one, for the more special purposes of horticulturists. The process is known as radio-culture; it is only in the experimental stages at present, and will probably, as will be shown later, find its widest future application in conjunction with other means of employing electricity in raising plants.

It was long thought that the growth of plants might be stimulated by the direct application of electricity to the soil in which they are living, and therefore to their roots. This supposition has been verified, more especially by the thorough experiments carried out by Professor Lemström in England, Germany and Sweden. The method employed is to pass a current through a wire net stretched above the surface of the ground. The real effect of this current is to induce another current, of the opposite kind of electricity, in the soil beneath the net. Similar experiments are being carried out by other investigators; an account of one series of trials in this connexion, namely, that being conducted by the Department of Economic Biology at Bristol University, was given on page 175 of the present volume of the *Agricultural News*. Although it was recognized early that a stimulus to the growth of plants may be obtained by this means, much more work has

**Farmers' Bulletin* No. 18, of the Department of Agriculture of New South Wales, entitled *Electricity and Agriculture.*

to be done before sufficient is known about its application and practice to decide upon its economic value.

Where plants are being grown under glass, on an intensive scale, the plan is feasible of employing radio-culture in conjunction with the means that has just been descibed, namely the induction of an electric current in the soil. An actual system, known as the Thwaite System of Electro-Culture is under trial at the Royal Botanic Gardens, Kew. In this, violet light is projected on to the plants from powerful lamps that may be arranged to send their rays in any direction; at the same time, an electric current is sent through the atmosphere and induced in the soil in the way described above. The plants have, naturally, to be provided with the proper amount of carbon dioxide and water, and the stimulus to their growth entails the insurance of a sufficient quantity of food in the soil by the use of suitable artificial manures. The dynamo producing the electricity is run by means of a suction gas plant, which also provides the power for driving an electric machine which yields the electricity for the atmosphere and the soil. Excellent results have been obtained under this system, the ordinary working expenses of which are said to be remarkably low

Other methods employing the more direct application of electricity to the plant and its environment include the utilization of the electricity present in the atmosphere, and the electrification of seed immediately before it is sown. In the first case, a kind of lightning conductor is erected in the field, and a network of wires running through the soil is connected with this, so that any exchange of electricity between the conductor and the atmosphere causes currents to arise in the wires that are in the soil. For the trials that have been made in the electrification of seed intended to be sown, the current used was such as may be obtained from an ordinary medical battery. In the employment of both of these methods, increased yields have been obtained; though they have not met with any extended application, as yet.

The application of electricity for agricultural purposes in less direct ways, such as that of the provision of energy for transport and for the carrying out of field operations, is being rapidly extended. The electric railway, the electric plough and the electric motor are bound to take an increasingly greater part in agricultural operations, in the future. The last of these is especially useful, as it can be made to provide a source of energy for driving all kinds of stationary machinery on a farm or estate. The efficiency, cleanliness and easy manipulation of such motors cannot fail to bring them eventually to a position of the greatest importance in relation to agricultural work.

Among the minor uses of electricity on farms and on estates are its employment in dairies and for driving machines used in the household work. More particularly in this relation, the existence of the telephone must not be forgotten; the utility of this instrument is being found especially great in the United States, notably with regard to the transmission of weather forecasts and storm warnings.

The consideration of the most important indirect applications of electricity to the uses of plants has been left to the last. These consist in the manufacture of nitrogenous manures in which the nitrogen has been obtained from the atmosphere. The most important of such substances as is well known, are nitrate of lime, or nitrogen lime, and calcium cyanamide, or nitrolim. The necessity for the manufacture of such substances was most plainly indicated, first, in a presidential address delivered a few years ago by Sir William Crookes before the British Association. The circumstances of this are familiar. Attention was drawn to the large waste of the nitrogen that was once in the soil, which is taking place through the methods in vogue for the disposal of animal refuse. It was evident that this animal refuse was originally in the form of plants, and that these plants had been enabled to grow because they could get nitrogen from the soil. It required little thought, therefore, to show that, unless some means was found to return this nitrogen to the soil, under conditions in which it would become available as plant food, or at any rate to replace the nitrogen in the soil by some inexpensive means, there was great danger that the supply of this valuable element would eventually decrease to such an extent as to diminish seriously the general rate of agricultural production. The manufacture of the manures mentioned has become a commercial possibility, owing to the recognition of these facts, and of the circumstances that such natural stores of available nitrogen as the nitrate beds of Chili must eventually become exhausted.

There is no need, here, to enter into details as to the manufacture of the substances mentioned—nitrate of lime and calcium cyanamide; it may be stated that the first process is described in the *Agricultural News*, Vol. VIII, p. 325, while the production of calcium cyanamide is dealt with in Vol. VII, p. 398. It will be sufficient to indicate the way in which electricity is used in making them. In the first case, it is employed to produce the highly heated space (or 'flame') which causes the oxygen and nitrogen

in the air to form oxides of nitrogen; these by their solution in water give nitric acid, which is neutralized with lime to form calcium nitrate. In the manufacture of calcium cyanamide, as well, the electricity is required to produce heat; actually, it brings calcium carbide to a temperature at which it is capable of absorbing nitrogen that has been obtained from the air, to form the cyanamide. In the latter case, the special reason for employing electricity is that it can be generated cheaply where there is an abundance of energy supplied by falling water; that is in the neighbourhood of extensive waterfalls.

In what has been said above, there is no attempt to make mention of all the investigations that are being undertaken in connexion with the application of electricity to the uses of the agriculturist. The purpose has been to summarize the methods of such application, in a broad way, as a means of increasing interest in a matter that is becoming of extended importance in connexion with the production of plants.

SUGAR INDUSTRY.

PRODUCTION OF SEEDLING CANES IN JAVA.

An article dealing with the methods for the production of seedling canes in Java appeared recently in the *Agricultural News* (Vol. IX, p. 195), and since this, attention has been drawn in several publications to the means that are employed there in such work. In view of the importance of the matter, an attempt has been made to gain a view of the conditions surrounding the work of obtaining and cultivating cane seedlings in that country, as it is evidently necessary to take account of these in endeavouring to form a true estimate of the improvements that have arisen solely and directly from the production and adoption of the seedlings themselves. Information which will enable this to be done has been kindly supplied by Mr. J. Lely, Chemist to the Antigua Sugar Factory, who has spent some years in Java as a Sugar Chemist; and the chief matters in connexion with the information are embodied in this article.

Mr. Lely points out, first of all, that the general adoption of the factory system in Java naturally brings it about that sugar is produced there under more economical conditions than in the West Indies, so that the cost of manufacture is much lower. In regard to the yields of sugar-cane that are obtained, these are mainly a result of cultivation and irrigation. The difference in the conditions which obtain in Java, as contrasted with the West Indies, makes it impossible to form any direct comparison of their respective sugar yields, on the basis of the influence of seedling canes alone. The climate of Java is much hotter, with a distinct rainy season, during which the precipitation amounts to 200 inches of rain, or sometimes much more. The supply of labour in the Dutch colony is better than that in the West Indies, and the labourers are more intelligent, and better agricultural workers. Again, in Java there is no ratooning of the cane; it is grown as a strict rotation crop, and the land may be thrown out of cultivation for several years, for the discouragement of pests and diseases. One of the chief circumstances, however, that helps to render the conditions in that island superior to those in the West Indies, is the extent to which irrigation is employed. There is added to all these circumstances the fact that the sugar lands are cultivated by the factories, so that there is greater economy, efficiency and consistency in working.

It is the general opinion that the richest canes in Java give the best yields. This is not in accordance with fact, at present, although it is an ideal which is being aimed at in the experiment station work conducted there. An additional point of interest is that the methods of obtaining seedling canes in Java appear to have much the same value as those employed for the same purpose in the West Indies. As a matter of fact, although a far larger number of seedling canes is produced in the first mentioned country, the percentage of these that have to be rejected for inferiority is higher than that in the West Indies.

These considerations lead to the conclusion that the improved yields of sugar-cane that are being obtained in Java at present are as much a matter of improved methods of cultivation and employment of irrigation as of the production of better varieties of sugar-cane. It is certain, in any case, that the great differences in the conditions of cultivation and climate in the West Indies will prevent the yields obtained here from ever becoming as large as they are in that country.

SPONGES COLLECTED FROM THE GRENADINES.

His Honour the Administrator of St. Vincent (the Hon. C. Gideon Murray) has sent, for publication in the *Agricultural News*, a list of sponges collected from the Grenadines, and identified at the Natural History Museum, to which the specimens were forwarded by the Director of the Imperial Institute, on their receipt from St. Vincent. The list is as follows:

Hippospongia canaliculata, var. *microtuba*, Leudenfeld.
Hippospongia canaliculata, var. *elastica*, Leudenfeld.
Hippospongia dura, Leudenfeld.
Spinosella sororia (Duchassaing, Michelotti), var. *dilatata*, Dendy.
Spinosella maxima, Dendy.
Agelas dispar (Duchassaing, Michelotti).
Hircinia sp.
Stelospongia sp.
A Chalinid sponge.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Berbice', for Grenada, on September 27, for the purpose of conferring with his Excellency the Governor of the Windward Islands on agricultural matters connected with that colony. Dr. Watts is expected to return to Barbados by the R.M.S. 'Balantia', on the 4th inst.

FRUITS AND FRUIT TREES.

THE IMPROVEMENT OF CACAO BY SELECTION.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for August 1910, contains an interesting paper by Dr. A. Fredholm, entitled Selection and the Cacao Industry. The purpose of the paper is to point out the necessity for the adoption of the principle of selection in regard to planting cacao, if the older centres of production are to regain and maintain their place in the cacao output of the world.

Dr. Fredholm commences by pointing out the advantages of seed selection in planting crops, especially the possession of the certainty as to the kind of plant that will be obtained from the seed that is put in the ground, and of the means which is given for obtaining improved strains of plants. Figures are then brought forward to show that several of the old areas of cacao production, including those in the West Indies, are obtaining a decreased share in the amount that is grown year by year. These are followed by a consideration of the position of Trinidad. This colony, thirteen years ago, furnished 22,400,000 lb. of cacao, which was equal to 12·9 per cent. of the whole production; in 1909 its share was 11·3 per cent., with 51,100,000 lb. It is pointed out that this demonstrates that, although the cacao crop of Trinidad has more than doubled, yet it has diminished 1·6 per cent., as regards the world's output. This means that, if the old percentage had been maintained, the cacao industry of Trinidad would have been worth $795,520 more than it is at present, reckoning the price of cacao at 11c. per lb.

This diminished percentage of production has been shared by nearly all the old cacao-growing countries. Their share in the market is being encroached upon by younger and more vigorous competitors, such as Brazil, Portuguese Africa, Venezuela, San Domingo, British Africa, Cuba and the German Colonies. Of these, British Africa has made the greatest progress; its export of cacao has risen from 123,200 lb., or 0·1 per cent. in 1897, to 52,900,000 lb., or 11·8 per cent. in 1909, which is an increase of 11·7 per cent. on the world's production. This increase on the part of the newer cacao-growing regions is likely to be maintained, because new plantations are being made year by year. In connexion with the decreased production in older countries, mention is made of the case of Surinam, where this has been caused by the outbreak of an epidemic—the witch broom disease; this is chiefly responsible for a loss of 4·8 per cent. on the world's production, owing to a fall from 10,080,000 lb. to 4,100,000 lb.

The prediction is made that the first result of the greatly increasing production in newer cacao-growing countries will be to change the manner in which cacao is graded. The use of place names in this connexion will be superseded by that of the names of the estates which shipped the cacao, as their produce will be exported under their own marks. It is therefore of importance to the West Indian cacao planter to know the way in which he can improve his cacao in order that he may be able to compete successfully with the products that will be shipped from other parts of the world, under the new system of grading.

The final conclusion reached in the paper is that selection will have to be adopted for the purpose of improving West Indian cacao, both in quality and yield. At the present time, the existence of different strains of trees on the estates is detracting from the uniformity of the product, and future labours will be to study these strains in such a way as to enable the planter to take advantage of the best among them, so as to obtain stocks and scions of the finest kinds, with the resulting superiority and uniformity of the product.

THE CULTIVATION OF RICE.

Instructions in regard to suitable methods of cultivating rice in British Guiana have been drawn up and approved by a Special Committee on Rice Growing, appointed by the Governor as President of the Board of Agriculture. These have been issued recently in the *Official Gazette,* and those among them of more general interest, and relating particularly to the growing of rice, are reproduced here:—

PREPARATION OF BEDS. Land to be put into rice should be laid out in beds, with dams 2 to 3 feet wide, and 2 feet high between. The beds should be carefully levelled, and arrangements made for drainage, and, if possible, for irrigation. The most satisfactory arrangement is to have the irrigation trench at the 'tops' of the beds, and so tapped that water can be admitted into any bed independently of the others by means of small boxed-in 'kokers', and a shallow drain running down the centre of the beds to drain all water to the 'bottoms' of the beds when necessary. In throwing up the dams between the beds, care must be taken to remove as little as possible of the surface soil, for the subsoil will only give small yields, and will rapidly become unproductive.

Only a thin layer of soil should be removed for making dams, and it is quite unnecessary to have them more than 2 feet high.

CULTIVATION. The best land for rice is a loamy clay. It should be carefully forked or ploughed about a month before the crop is to be planted, but if the land has already been in cultivation in rice, it should be prepared at least six weeks before replanting. This forking or ploughing should be about 6 inches deep, but should not turn up the subsoil to any great extent. The first part of the land to be cultivated should be the nursery. This should be situated on the best lands, as on the careful choice of the nursery plot often depends the success or failure of the crop. Immediately after forking, the land chosen for the nursery should be flooded, levelled and prepared for sowing. The working of the soil, after forking or ploughing, is usually done with a hoe, or by means of a primitive form of harrow. Levelling may be accomplished by dragging a log of wood backwards and forwards, or by inverting the harrow and drawing that across the beds. This preparation should not be to a greater depth than 4 inches, and the soil should be in a condition of 'drift mud' before it can be considered to be in a first class condition for planting.

TIME OF SOWING AND QUANTITY OF SEED REQUIRED. Sowing of the seed in the nursery should commence late in March or early in April, and should be completed in the month of April, if the best results are desired. Only by planting at this time of the year can maximum crops be depended upon. The quantity of seed necessary to plant an acre is calculated to be from 8 to 10 gallons, according to variety and to its germinating power. It should always be remembered that sowings in the nursery should be successive. No more rice should be sown in the nursery than can be transplanted, when that time arrives, in about a week; for seedlings in the nursery are generally ready for transplanting in four weeks from the time of sowing, and are of little use after six weeks, as they have begun to 'joint' at the base. If 5 acres of rice can be transplanted each week by any cultivator, the maximum he should propose to cultivate should be 25 acres in all, and sowings in the nursery sufficient for 5 acres should be made every week from the commencement of the sowing to the last week in April.

SOWING OF SEED IN NURSERY. Seed selected for sowing should be placed in a bag and soaked in a trench for twenty-four hours. It should then be taken out and placed on dry land in the shade, and covered down with leaves, etc., for another twenty-four hours. It should then be thinly broadcasted in the nursery beds, which should be perfectly level and moist. No water must be on the surface, however, or otherwise the seeds will rot. During growth, the surface of the soil must be kept moist by allowing a small quantity of water to flow over the beds, or by watering the young seedlings with cans. Ducks do not attack germinated seed as readily as they do hard paddy.

TRANSPLANTING. When the seedlings are about four weeks old they are ready for transplanting for the general crop. The plants should be about 12 to 15 inches high at this time, and should have no 'joints' showing at their bases. The lifting of the plants from the nursery must be carefully carried out. It is not sufficient to simply pull the plants up. Before lifting, the soil around the roots should be loosened by sticking the fingers of both hands down around a quantity of plants, so that a good 'double-handful' can be taken up with all the mud adhering to their roots. The greater portion of this mud should then be washed off and the plant put on one side until about 1,000 washed plants, which are to be made into a bundle, are obtained. The bundles are then carried to the fields for the planters and, to save time, they should be so distributed over the beds that the planters can readily obtain them. The planter undoes the bundles, takes out a handful of plants, washes off practically all the soil attached to the roots, screws off the top 3 or 4 inches of the seedlings and proceeds to transplant. The plants are pushed, two to three plants in a hole, at distances of from 9 to 12 inches apart in the soft 'drift mud' to a depth of 1 or 2 inches. It is desirable that when the plants are taken out of the nursery only the strongest plants should be chosen, the weaklings being discarded, and it has been found that the best results are obtained from the Creole variety and with Nos. 75, 3 and 6, when the distances between the holes are not less than 9 or more than 12 inches.

AFTER CULTIVATION. Plants after transplanting usually lie flat for a day or two and then commence to stand upright. In a week, if the land has been carefully prepared they will have taken root. As soon as a bed has been transplanted, water, in irrigable areas, should be run on at once and should not be more than 2 inches deep until the plants have taken root. Afterwards the irrigation water should be kept at from 2 to 3 inches as a minimum depth, to 5 to 6 inches as a maximum. Two weedings should generally be given to a rice crop after it has been transplanted, during the early period of its growth.

AGRICULTURE IN GAMBIA.

So long as the ground nut crop continues to thrive and to give the large return to cultivators and traders that it does at present, it is difficult to induce the people to take up other industries seriously.

The issue of 500 tons of seed-nuts by the Government to the people for planting (mentioned in last year's Report) is accountable in a considerable degree for the large increase in the nuts produced. The above amount was advanced by the principal firms. The introduction of the Coromandel nut has met with considerable success.

His Excellency the Governor has obtained through the late Sir Alfred Jones, Chairman of Messrs. Elder Dempster & Co., a consignment of $3\frac{1}{2}$ bushels of soy beans for experimental purposes. These beans were carefully distributed to selected chiefs, and their planting and care were carefully watched over by the Travelling Commissioners, but the result has been disappointing, and it appears that the soil is not favourable to their introduction.

African millet, or koos, continues to be cultivated by the natives and, as has been shown in the trade section of this report, its produce this year has been most successful, thus decreasing the demand for imported rice.

The agricultural schools and farm at Abuko, subsidized by the Government and managed by the Roman Catholic Mission, has made great progress, and experiments have been made in planting cacao, coffee, kola-nuts and other products, which promise well.

The imported Ayrshire bulls have been carefully housed and have thriven. They have had some success, but the natives of the country are very slow in availing themselves of their services. The number of calves showing an improved appearance is satisfactory evidence that the cross with the native cattle will result in a very much improved breed.

Some he-goats were imported from the Canary Islands, but did not stand the Harmattan wind, and the first consignment succumbed, but it is hoped that their progeny will thrive, and a further attempt to import and acclimatize them will be made. (*Colonial Reports—Annual*, No. 641, p. 12.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 12, with reference to the sales of West Indian Sea Island cotton :—

A moderate business has been done in West Indian Sea Islands since our last report, chiefly in Barbados and St. Croix at 19½*d*. There has also been a sale of St. Vincent stains at 12*d*.

The buyers who purchased stained West Indian early in the season, to take the place of Egyptian, have ceased to use them, owing to the fall in price of the latter growth, and we therefore can only depend upon the ordinary Sea Island buyers, who value them on a distinctly lower basis. It would be difficult to dispose of them at a considerable decline from our original valuations.

The Florida market opens at 17*d*. to 18*d*., which is about 1*d*. to 2*d*. per lb. more than was expected, but we do not think that the present quotations will be held for long, as the crop appears to be a fairly satisfactory one.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 3, is as follows:—

As the crop is reported to be two weeks backward, and harvesting has been delayed by recent heavy rains, we do not think that receipts of the new crop will be large enough to admit of the market opening before the middle of October.

The stock remaining on hand here of old crop cotton is only 53 bales, consisting of planters' crop lots, held at 40c. to 50c. It is quite impossible just now to say at what price the market will open, but we will, later on, endeavour to give you some approximate idea of the views of buyers.

COTTON-GROWING IN INDIA.

The *Textile Mercury* for August 6, 1910, gives an account of the proceedings of a recent deputation to Lord Morley, at the India Office, the purpose of which was to urge the desirability of the provision, by the Indian Government, of every assistance possible toward the extension and improvement of cotton-growing in India. Among the delegates was Mr. C. W. Macara, the President of the International Cotton Federation. The recommendations finally made by them were as follows:

(a) That, in order to encourage the cultivation of better qualities of Indian cotton, special attention be devoted to the selection of seed of the indigenous growths, and that an increase be made in the number of seed farms.

(b) The engagement of cotton specialists and trained staff.

(c) The establishment of cotton-buying centres similar to those of the British Cotton Growing Association in Africa.

(d) An increase in the number of agricultural banks.

(e) The abolition of the export duty on cotton grown in the Native States.

(f) The introduction of fortnightly ginners' reports.

THE SEA ISLANDS COTTON CROP, 1909-10.

A report, dated September 3, 1910, received from Messrs. Henry W. Frost & Co., Charleston, S.C., in addition to their ordinary fortnightly report, contains a statement of the Sea Islands crop for 1909-10, and an account of the Sea Islands market, during the same period, the latter of which is reproduced here:—

The crop was late in being marketed, as rains had retarded the harvesting. Therefore, it was not until the middle of October that the total receipts amounted to 300 bales. The market opened on October 16, with sales of 400 bales on a basis of Fine 28c., Fully Fine 30c., Extra Fine 32c.

The factors having disposed of their offerings decided not to sell further, except at an advance of 2c., which caused a quiet market until October 30, when they succeeded in getting the advance asked, selling 1,350 bales on a basis of Fully Fine 32c. This demand was principally for export to England. Having disposed again of all the receipts to date, the factors were much encouraged and then decided to hold for a further advance of 3c., over their last sale, being confirmed in their views by the active demand for Georgias and Floridas at advancing prices.

It was not long before some urgent demand admitted of their selling, on November 6, 750 bales at the full advance demanded, viz., basis Fine 33c., Fully Fine 35c., Extra Fine 37c. However, with this demand supplied, the market assumed a quieter tone, with the stock accumulating on account of large receipts. The sales during November, December and January were confined to the lower grades, viz., Fine at 32c., and Fine to Fully Fine, off in colour, at 28c. to 30c., the buying being for England and the Northern Mills; the trade generally refused to pay the full prices demanded for the higher grades. Therefore, the stock continued to increase, and in February both the planters and factors began to show

more eagerness to dispose of some of the accumulated stock, in order to settle their accounts and to make preparations for the planting of the new crop. Consequently, on February 19, they consented to sell quantity on a basis of Fully Fine 32c., Extra Fine 33c., which was a sharp decline from previous asking prices. This resulted in the unprecedented large sales of 5,000 bales on the above basis, in which were included a large proportion of planters' crop lots, the buying being principally for export to England.

This left unsold only about 1,500 bales of the crop, consisting largely of planters' crop lots held at 40c. to 50c. From then on, the market ruled firmer, and the balance of the crop was disposed of at better prices, with Fully Fine advancing to 35c. to 36c., Extra Fine crop lots 37c. to 40c.

The season came to a close very early, as before the end of March nearly the entire crop had been disposed of. The small stock left on hand consists of planters' crop lots held at 40c. to 50c., which is above the views of buyers

TAPPING PARA RUBBER TREES.

Extracts from Bulletin No. 10 of the Department of Agriculture of the Federated Malay States, dealing with this subject, and issued by W. J. Gallagher, M.A., the late Director of Agriculture, were given in the last number of the *Agricultural News*. At the time, it was stated that the series of extracts then presented would be followed by a further one in the next number of the *Agricultural News*, so that these are given now, as follows:

TAPPING YOUNG TREES. As far as my experience goes, the actual removal of latex within reasonable limits, has no prejudicial effect on young trees; indeed the impression that such trees increase more rapidly in girth after tapping can hardly be resisted. There are no figures to show whether it is harmful or the reverse. I am fairly well convinced that it is merely quality of tapping which counts. The bark is so thin on young trees that it requires very careful work not to wound; the tapping is slow; the yield not big, and there is more than the usual percentage of scrap. On the other hand, more cuts to the inch can be done on soft-barked young trees than on old ones of say nine or ten years old tapped for the first time.

Young trees, which measure 18 to 20 inches at 3 feet high, might be tapped as follows. Put on a basal V, 18 inches high, and tap every day. This will last a year. The second year put a similar V on the other side. The third year begin the one quarter in one year system on either of the first two quarters tapped, and put on cuts as high as the girth allows, taking the opposite quarter the fourth year. I depart here in the first two years from the one quarter in one year system, because (a) we know that in trees five or six years old, which have had only one cut put on them, the renewed bark is thick enough in two years to be tapped again; (b) the cuts are short and the distance which building material must move transversely is not so great as in later years, and (c) the cut on one quarter is too short and the bark higher up is too thin, if two are put on, to tap without considerable wounding.

Generally, one cannot say in respect of a young clearing: Put one V cut on every tree above a certain girth at three feet high. A number of trees may be large enough for two or more cuts. Such trees should be tapped on the method of one quarter in one year. This still maintains the regularity of the system.

It is scarcely worth while to start tapping unless 65 per cent. of the trees are at least 20 inches and over at 3 feet. When this is the case, all up to 18 inches may be tapped, and this will generally amount to 75 per cent. No others should be taken in, except at intervals of a year. It is quite common to find planters taking in additional trees almost every week. This is distinctly unpractical. It interferes with the coolie's task, and with the uniformity of the tapping system.

DISTANCES IN PLANTING. In choosing distances, allowance must be made for fungus, white ants, wind, and 'weedy' trees. I estimate that on virgin jungle land, from 15 per cent. to 20 per cent. of the trees originally planted will have been lost by the time the trees are seven years old. I recommend 120 to 140 as a reasonable number per acre; 100 is a fair number to have when the trees are seven years old. Shade is wanted in the first years of tapping, so that as little direct sunlight as possible may strike the latex on the cuts and in the cups.

It is better to err on the side of having too many than too few trees. It is well to start with an excess; and this would be very advisable if the planter had courage to thin out in the way he ought.

THINNING OUT. This is an operation requiring attention. It cannot be left to the care of a native conductor. You must make your own choice judiciously. It is a waste of time and money to get over the difficulty by ordering every alternate tree or every second tree, as the case may be, to be cut out. Poor trees, and those with few branches and leaves, and over which their neighbours have already met, are those to cut out. In some cases it may be necessary to cut out three adjacent trees because they are poor in size.

My present view is that thinning out should be done in the fifth and eighth years; but the distance the trees have been planted apart and the growth will modify this. Most thinning I have seen shows a lack of discrimination.

The roots should be completely taken out and burned, along with the stem and every branch. The root, if left in the ground, may encourage both white ants and fungus; and dead branches and stems above ground may assist the spread of the branch and stem disease which attacks Para.

TOPPING TREES. There is very little topping done at the present time, and it is to be strongly discouraged. The loss from wind when such trees get to five or six years old is considerable.

Thumb-nail pruning is not quite so bad. Most young trees, if left alone, will naturally branch, at the latest, at the end of the second year. This might be brought on earlier by cutting off all leaves except a few near the tip. Personally, I do not recommend interference intended to cause earlier or more prolific branching.

PRUNING. This should be commenced as soon as the trees begin to branch. It goes without saying that no branch should be allowed to grow below 6 feet in height. I am inclined to go further and say that a clean stem should be maintained up to 10 feet high. As I have already said, it is too much of a demand on the tree to tap it completely in four years to a height of 10 feet, and I do not think much upper tapping will be done in the future. But it is well to be prepared for eventualities, and bad work below, or other reasons, may force you to do upper tapping.

I have elsewhere pointed out that a branch must be sawn off close to the stem. It should be first hacked off anyhow, about 9 or 10 inches from the stem, and the stub then sawn off neatly and as close as possible to the stem. Tar should be put on the wound; but it must be applied carefully; it should be confined to the wound, and not allowed to stream over the stem. Tar, as most of you know, kills the living tissue when it covers more than a few inches.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The subject of the editorial in the present number is The Use of Electricity in Agriculture. It shows that the employment of electricity in agricultural operations and production is increasing quickly in extent.

On page 307, an interesting article appears on the production of seedling canes in Java, a comparison being given of the conditions in that country, in relation to agriculture, with those in the West Indies.

An abstract of an interesting article that has appeared recently on the improvement of cacao by selection is given on page 308.

On the same page, and on the next one, details as to the cultivation of rice are presented.

The article on the tapping of Para rubber trees, which was commenced in the last issue, is concluded on page 311.

The Insect Notes, on page 314, deal with three matters that are of present interest.

The second of the articles on some diseases of rubber trees, which are being given under the heading of Fungus Notes, is presented on page 318.

Creasote for Preserving Gate Posts.

An account of experiments which are being conducted in Antigua for the purpose of investigating the usefulness of creasote in preserving wooden posts, has been received from Mr. T. Jackson, Curator of the Botanic Station.

This shows that, in December 1905, four pitch pine gate posts were erected at one of the experiment stations, in each of which two holes were drilled, one of these being at the top of the post, and covered; the other was at about 18 inches from the ground level, and bored at an angle of about 70°. The holes were from 15 to 18 inches deep, and had a diameter of ¾-inch. When the posts were planted, the holes were filled with creasote, and have been kept filled almost continually since the time of erection.

It is of interest that these posts are still in a perfectly sound condition. In order to add to the value of the experiment, exactly similar posts were erected in February 1909, but did not receive any kind of treatment. It will be interesting to compare the durability of these, in future years, with that shown by the treated posts planted in 1905.

Agriculture in the Northern Territories of the Gold Coast.

An interesting account of the trade, agriculture and industries of the northern territories of the Gold Coast is given in *Colonial Reports—Annual*, No. 639. According to this, the principal articles of export are live stock, shea butter (from *Butyrospermum Parkii*), dried fish, and general native produce, including maize, yams and fowls. The largest export of live stock is to Ashanti, and this trade is increasing, under the encouragement of the Commissioners.

The staple industry of the Protectorate is agriculture; but the natives, so far, have only cultivated products such as cotton, maize, Guinea corn, yams, ground nuts and fibres, to supply the local demand. Efforts are being made to induce them to grow such products for export. Cotton is regarded as being the most important of these, and during the year under report, the Briti-h Cotton Growing Association sent out an expert to investigate the possibilities of this crop. In the result, a favourable report has been received on Gonja and Daboya cotton, and the opinion is expressed that American varieties could be raised successfully.

For the purpose of instructing the natives in cotton-growing, and to make trials of other products that may be raised for export, an agricultural station was opened at Tamale, in June 1909. It was the intention shortly to place this in the charge of the late manager of the British Cotton Growing Association's stations at Labolabo. This association is encouraging the growing of cotton, by natives, by deciding to buy all that is brought in by them, in accordance with an agreement made with the Government.

Attempts are being made, by teaching the natives the principle of selection in breeding, to effect an improvement in the local breed of cattle.

Trade of Mexico, 1909.

The *Diplomatic and Consular Reports*, No. 4498—Annual Series, gives the following information concerning the products of Mexico, of an agricultural nature, that were shipped during 1908-9.

The chief agricultural exports are henequen (sisal hemp) and coffee. Of the former 107,809 tons, value £2,438,027 was exported, as against 110,746 tons, value £2,758,224, in 1907-8 As regards coffee, there was an increase from 21,459 tons, worth £1,081,315, in 1907-8, to 26,692 tons, worth £1,260,567 in 1908-9.

The shipments of rubber, in 1907-8 amounted to 5,624 tons; this was greater in 1908-9, being 6,015 tons; at the same time, there was a slight decrease in the value of the exports. There was a large increase in the export of guayule shrubs for making rubber, namely from 1,293 tons, valued £125,852 in 1907-8, to 3,022 tons valued £463,567 in 1908-9. Thus this export became greater by about 275 per cent.

Fresh fruit from Mexico finds an excellent market in the United States, and the amounts exported in 1907-8 (7,239 tons, worth £38,430), increased to 9,351 tons, worth £49,305, in 1908-9. There was a decrease in all the following exports: timber, raw tobacco, dye-woods, chickpeas and vanilla.

A Test for Dirt in Milk.

It is sometimes useful to be in possession of a test which will show in a simple manner the extent to which germs are present in milk, especially as the determination of this gives some indication as to the amount of care that has been exercised in obtaining and purveying the milk. In this connexion, a method of testing, called the Reductase Test, is described in the *Transvaal Agricultural Journal* for July 1910, p. 654.

A description of the reductase test is as follows. Ten cubic centimetres of the milk to be tested are shaken well with ½-c.c. of a solution of methylene blue in a test bottle, or tube, which has been boiled in water. The air is then excluded by pouring liquid paraffin wax into the bottle to a thickness of about 1 cm. Finally, the bottle is placed in water which is kept at a temperature of 45° C. The colour of the methylene blue gradually disappears, and the longer the time this takes to happen, the purer is the milk.

The solution of methylene blue is prepared by dissolving ½-gm. of the pure substance in about 15 c.c. of 96 per cent. alcohol, at a temperature of 70° C. The blue solution is then cooled and filtered, and water is added to the liquid which comes through the filter, in the proportion of 1 part of the liquid to 39 parts of water.

The test depends upon the fact that the germs in the milk produce reductase, which has the power of decolourizing methylene blue; so that the smaller the amount of germs present, the longer it takes for the colour to disappear. This explains why air is excluded while the test is being conducted, for if it were not, the oxygen in it would destroy the reductase that is being formed by the germs, and would thus render the test useless.

The Production of Rice in Japan, 1909.

The *Diplomatic and Consular Reports*, No. 4451 Annual Series, shows that the production of rice in Japan, during 1909 reached a record, so that the export figures exceeded 59,000 tons. At the same time, it is probable that the growth of the figures will be still more pronounced in the present year, as much of the 1909 crop still remained to be shipped on December 31. The large production was not, however, a great boon to the growers; many of them complained that a smaller crop with normal prices would have suited their interests better. The richer growers have been holding for an increase in price.

The chief purchaser of the rice was Hawaii, because of the possession of its large Japanese population. The amount taken by the United Kingdom was doubled, and there was a large increase in the exports to France, the Netherlands and Austria-Hungary.

Manurial Experiments with Maize.

One of the subjects treated in Farmers' Bulletin No. 107, of the Transvaal Department of Agriculture, entitled *Results of Experiments: Experimental Farm, Potchefstroom*, deals with the conclusions that have been arrived at after investigations into the manuring of maize. These are in the nature of a continuous experiment, which was commenced in 1906. The trials are in two series, in both of which the treatment of the plots in order, is as follows: no manure; farmyard manure (8 tons per acre every third year); superphosphate; superphosphate and sulphate of potash; basic slag; dissolved bones; bone meal; guano; and no manure. The only difference between the two series is that one receives applications of nitrate of soda, while the plots in the other do not obtain this manure.

The experiments are carried out, under the most equable conditions obtainable, on a brown loam which is very poor in plant food—both available and unavailable—especially as regards nitrogen and phosphoric acid. The soil also contains insufficient lime.

It was shown, in the result, that the application of nitrate of soda was not remunerative, and other experiments confirm this. The explanation of the circumstance is given as follows: (1) the loss of the nitrate of soda through the washing caused by heavy rains, which are common; (2) the rapid conversion of the soil nitrogen into nitrates; thus artificial application of these is not required; (3) the rapidity of travel of water through the plant during the growing season, so that, although the soil water contains only small amounts of salts, enough passes through to provide as much of these as the plants require.

Potash produced losses which may probably be explained by its effect on the texture of the soil.

A distinct gain followed the use of phosphates, and the general advice is given that the farmer should employ superphosphate and bone meal in the first and second years, and bone meal alone, afterwards.

INSECT NOTES.

A SUGGESTED WAY TO DETECT EEL WORMS IN CANE FIELDS.

In an article published in the *Agricultural News*, Vol. VIII, p. 138, an account is given of the general life-history of eel worms (nematodes), and special mention is made of one species, *Heterodera radicicola*, which attacks the roots of many different plants throughout the world, and causes characteristic galls to appear on them. In the article referred to, the suggestion is made that the roots of the sugar-cane in the West Indies may be attacked by these pests, but that the characteristic swellings are not produced. Cobb, in Bulletin No. 6 of the Division of Pathology and Physiology of the Experiment Station of the Hawaiian Sugar Planters' Association, states that the young roots of the sugar-cane in Hawaii are attacked by these worms, and that they exhibit long narrow swellings, in consequence. Although these swellings are present, they might easily be overlooked; and besides, when growing under estate conditions, the cane is not a very easy plant to handle for purposes of observation of the roots. Consequently, it is suggested that soils might be tested for the presence of *Heterodera radicicola* by the following method.

In several places in the field in which the soil is being tested for the presence of eel worms, plants should be grown which are exceptionally prone to attack by the worms, and which exhibit large and unmistakable galls when they are affected by them. The remainder of the field may be planted in cane, in the ordinary way. If the experimental plants look unhealthy, or appear to be dying, they should be removed, and their roots examined for swellings. In any case, the roots should be examined when the plants are mature and are dug up. If galls are present, it will be a sure sign that the soil is infested with nematodes.

Among plants suitable for the experiment described above are melons, cucumbers and squashes, more particularly if they are grown from the imported seed of superior varieties. Ochros will also serve the purpose.

If experiments of this kind are systematically carried out, valuable information should be obtained as to the distribution, and frequency of occurrence, of *Heterodera radicicola* in the West Indies. The whole question is of interest, as it is conceivable that the presence of root diseases of sugar-cane, Indian corn, and even limes, may be dependent to some extent on attacks by these animals.

A COTTON-EATING BEETLE.

A communication which has been received recently from Mr. C. Rey, of Anguilla, states that a certain amount of damage is being done to cotton in that island by a small beetle. The effect of this attack is to delay the maturity of the cotton crop for two to four weeks, even when no greater damage is done.

It is probable that the beetle to which reference is made is the one mentioned as doing damage to cotton, in the *Agricultural News*, Vols. III, p. 357; IV, p. 266. This is *Hopatrinus gemellatus*, and it has been recognized as a cotton pest, to some extent, in Anguilla and St. Martins. As is stated in the second article in the *Agricultural News*, this insect is widely distributed throughout the West Indies, having been reported from Antigua, Guadeloupe, St. Vincent, Grenada, and Barbados, as well as from the islands already mentioned.

The account goes on to show that growing plants are rarely affected by the members of the family to which this beetle belongs; it appears, however, to have acquired the habit of attacking young cotton plants just below the surface of the ground, and it is, therefore, important that measures should be taken for its control, as soon as it appears.

Mr. Rey states, in the communication to which reference is made above, that he has been making trial of means to kill the beetles; these have included the employment of both contact and stomach poisons. The first consisted of carbolic acid solution, 1 in 24, and kerosene oil emulsion, 1 in 10, and they were found to be successful. The method employed is to raise the stone beneath which the beetles hide during the day, and then to spray them with the insecticide. The chief objection to this means of control is the expense in the matter of the provision of labour. In the trials with a stomach poison, the bait used was that employed for cut worms (see *Agricultural News*, Vol. V, pp. 167 and 182); no definite results have been obtained, as yet, although some of the beetles have been killed. Mr. Rey thinks that the beetles do not feed regularly, so that the mixture is required to be effective on more nights than one; he therefore suggests that on the second night, the bait, which has become dry in the sun, should be sprayed with clean water.

It will be of interest if cotton planters in the West Indies will keep a watch for beetles and weevils attacking cotton in the field, and will communicate their results, sending specimens at the same time, to the Department.

LEAD CHROMATE AS AN INSECTICIDE.

The contents of a pamphlet, issued by the Agricultural Research Institute, Pusa, dealing with the use of lead chromate in the place of arsenial insecticides was given on page 159 of the current volume of the *Agricultural News*.

Further information as to the experiments which led to the adoption of this insecticide is given in the *Agricultural Journal of India*, Vol. V, p. 138. It appears that objections had been taken to the use of lead arsenate in India on account mainly, of its poisonous nature, both in regard to plants and animals, the fact that it decomposes if it is kept in paste form, and of the difficulty of obtaining it. In consequence, careful trials were made of possible substitutes, and as a result of these it was found that such bodies fell into four classes: (1) those that killed in twenty-four hours; (2) those that killed in twenty-four to forty; (3) those that killed, on an average, in from forty to 100 hours; and (4) those that acted irregularly, or were without effect.

The quality sought in the insecticides were (1) insolubility in water; (2) cheapness; (3) stability, so that compounds may not be formed which would poison the leaf. Among the substances investigated was a dry paint compound called Lemon Chrome, which is a mixture of gypsum and lead chromate. The consequence of the discovery of this was that trials were made with lead chromate, as a result of which it exhibited a marked superiority over all other substances, showing the following advantages: (1) it is easily made in paste form; (2) it is yellow and therefore easily seen; (3) it is extremely insoluble; (4) it does not usually decompose, but even if it did, any soluble chromates formed would be less poisonous than arsenical substances; (5) it is not easily washed off; (6) it contains no arsenic. The amount of the insecticide (full strength) to fill an ordinary kerosene tin is obtained by mixing 2 oz. of lead nitrate with 1 oz. of potassium bichromate. The usual strength is one-half of this.

ST. LUCIA: ANNUAL REPORT OF THE MEDICAL OFFICER 1B. DISTRICT, 1909.

A copy of this report, received from the Colonial Office, shows that the work of this officer, Dr. Lucius Nicholls, has included interesting investigations in the laboratory with regard to: (1) rat viruses; (2) the natural enemies of mosquitos and mosquito larvae; (3) the naming and examination of mosquitos and biting insects; (4) the examination of morbid tissues. In the first of these, the results showed that the virus was effective if it was exalted, that is to say, increased in virulence by passing through several rats, and distributed for immediate use.

Mention is made of the extent to which ankylostomiasis occurs in the island; this was shown by the fact that the worm was found in twenty-three consecutive post-mortem examinations of adult paupers. The greater part of the report is, however, taken up by a consideration of mosquito larvae and their natural enemies, and this will be given special attention.

It is pointed out, first of all, that Governments with limited funds cannot be expected to undertake large drainage and reclamation schemes for the purpose of reducing the number of mosquitos, and special attention is given to the usefulness of millions and other enemies of the mosquito in this connexion. The Anophelinae of St. Lucia are *Cellia argyrotarsis* and *C. albipes*, and observations showed that the larvae of these live chiefly in water where there is a supply of surface food, contained usually in protected, non-permanent, unshaded pools, where there is not a continuous current and where their natural enemies are not present. It was found that the larvae will not grow unless surface food is provided.

Experiments with millions (*Girardinus pœciloides*) showed that these could be gradually accustomed to living in iron tanks, in darkness, in water from brackish swamps, or in water having temperatures ranging from 55° F. to 101·5° F.

The natural enemies of millions are stated to be water-fowl, cray fish and the larger fishes; they are protected, however, to some extent from these where the water in which they live is occupied to any degree by vegetation. Other enemies of mosquito larvae that are mentioned are a small crustacean of the sub-order Decapoda, and certain dragon fly larvae.

After an interesting account is given of measures for the reduction of the number of mosquitos in Anse-la-raye, the most malarious village in St. Lucia, suggestions are made for the breeding and distribution of millions locally, and to other countries. In this connexion, Dr. Nicholls does not appear to be conversant with the work of the Imperial Department of Agriculture which has included the successful introduction of this fish into Guayaquil, and into the Malay States and Sierra Leone, with the assistance of the Zoological Gardens, London. (See *West Indian Bulletin*, Vol. IX, p. 388; *Agricultural News*, Vol. VIII, pp. 9, 106, 231, 314 and 464; Pamphlet 55 of the Department Series, entitled *Millions and Mosquitos.*) Attention may be also drawn to the effective manures that have been taken, in relation to local distribution in Antigua.

A report which deals with much useful work concludes with a consideration of the effectiveness of the distribution of quinine, and of the adoption of measures to prevent the accidental provision, through carelessness, of breeding grounds for mosquitos; and full recognition is given to the great importance of education in obtaining the general adoption of measures for the prophylaxis of malaria, as well as of other tropical diseases.

BAHAMAS: REPORT OF THE BOARD OF AGRICULTURE FOR THE YEAR 1909.

This report is contained in Vol. V, No. 1, of the *Bulletin of the Department of Agriculture*, Bahamas. It shows, first of all, that progress in the improvement of agriculture is being maintained in those islands. In considering the general agricultural conditions of the colony, it is stated that the work of the department is hindered, as regards the Out Islands, by the lack of demonstration farms; although much good work is being done by means of co-operative experiments with farmers. The necessity is indicated of the possession of an agricultural bank, for the purpose of assisting small cultivators.

The total value of the shipments of sisal fibre, which is the most important product of the colony, was £42,627. In view of the extended production of this fibre in other parts of the world, ways are being sought of increasing the number of its uses. The export of pine-apples was worth £22,853; the market for this fruit, either green or canned, is entirely in the United States, on account of the inability to compete with the cheaply produced Singapore pine-apple, in England. Grape fruits were exported to the value of £1,264, and the shipments of oranges were worth £412, the numbers of the fruits being respectively, 276,576 and 465,050. The complaint is made that the citrus industry requires care in the handling and shipment of its products; and it is stated that more information is wanted as to possible markets. In the exports of cotton, an increase of £85 was shown, the total value being £319. The popularity of this crop in the Out Islands is increasing, and it is likely that the coming year will see an extension of the area planted. As regards tobacco, 23,800 cigars, valued at £122, were exported. Among minor products were exports to the following values: tomatos £148, preserved guavas £97, bananas £67, pumpkins £66, and onions £48. The production of these is showing a fairly rapid growth, as increased amounts are being employed for local consumption.

The chief of the forest products were lignum vitae, with 273 tons, worth £586; Sabica, 93 tons, worth £257; bark 133,156 ℔. worth £2,169. In a general way, as regards the agricultural prospects of the Bahamas, it would appear that an extension of the demand for sisal is required; the onion industry does not increase; rubber-growing will not attain a large importance, because the plants have to be cultivated there on a small scale; the cotton industry is growing; while, finally, very much more requires to be done in the direction of raising corn and ground provisions for local use

An interesting account is given of the work of the experiment station, which included investigations in connexion with the following crops: arrowroot, onions, broom corn, cassava, maize, citrus plants, cotton, fodder plants, pine-apples, rubber, sugar-cane, sweet potatos and tobacco. The report concludes with a useful account of the agricultural conditions of the chief among the different islands, from which valuable information regarding the Bahamas may be gained.

GLEANINGS.

Information has been received as to the amount of sugar that has been exported from Antigua for the crop season which has just ended. It appears that this was 12,754 tons. Of this quantity, 6,411 tons consisted of grey crystals, while the rest (6,343 tons) was made up of muscovado sugar.

A communication from the Agricultural Superintendent of St. Kitts-Nevis states that useful falls of rain have been experienced recently in St. Kitts, with the result that the condition of the sugar-cane crop has greatly improved, and that the cotton crop, which suffered no damage, is a promising one.

An account of the grass *Paspalum dilatatum* is contained in *Farmers' Bulletin* No. 8, of the Department of Agriculture of New South Wales. This shows that the tendency of the roots of this grass to grow deeply into the soil makes it a good drought resister, so that it is available as a useful food for stock, even when other kinds of grasses have almost dried up.

The prospectus of a company, to be known as the Beet Sugar Founders, Ltd., with a capital of £25,000, has been received recently. The purpose of the company is the establishment of beet sugar factories in various parts of the British Isles, and the services of Mr. Sigmund Stein, the authority on beet sugar manufacture, have been retained for its use.

A preliminary forecast of the sugar-cane crop of Eastern Bengal and Assam, dated July 25, 1910, gives the probable area of sugar-cane for the crop of 1910-11 as 177,700 acres. This is an increase of 6,100 acres over that of last year, and is said to be due to favourable weather conditions at the time of sowing, and the better prices of raw sugar that were prevailing at that period.

Through the courtesy of its inventor, Mr. Oliver Nugent, a drawing has been received of a new form of hoe. This differs from the ordinary kind in that the working edge is serrated, and this is said to add to its efficiency as an agricultural implement. The hoe is manufactured by Messrs. Elwell & Co., and may be obtained from Messrs. W. Forrest & Co., Market Street, Antigua.

A report by the Agricultural Instructor, Nevis, for the month of August shows that, owing to the improved rainfall during that month, the condition of the cotton crop has greatly improved, especially where it was planted early, and that with suitable weather, its future prospects are good. About 1,300 acres have been planted in cotton in the island, during the present season; of these, 760 acres are on estates, and 540 are under peasant cultivation.

An abstract of a paper appears in the *Journal of the Chemical Society*, No. 566, p. 1,048, which deals with investigations undertaken for the purpose of studying the formation of proteids in plants. It is concluded that the nitrogen absorbed in nitrates enters hydrocyanic acid and amino compounds, on the way to the formation of proteids. This conclusion is supported by an experiment in which plants of *Sorghum vulgare* were made to utilize asparagin as food.

The conclusion is reached, in the *Proceedings of the Royal Society*, No. B. 552, p. 63, that, as regards sleeping sickness, the insect (*Glossina palpalis*) which carries the trypanosome which causes the disease, can retain its ability to infect human beings for a period of at least two years, even after the removal of the population from the district, and the consequent lessening of the chance of its again taking up the germ of the disease through biting an infected person.

The *Experiment Station Record* of the United States Department of Agriculture for August 1910, p. 119, gives a short note on a paper which contains the results of experiments in regard to rainfall. In these, observations with three rain gauges, placed at distances of 4,200 feet from one another, indicated differences of rainfall which amounted to a maximum of 68 per cent. of useful precipitation.

The *Centralblatt fur Bakteriologie*, Vol. LII, p. 455, presents an account of experiments with the Ratin bacillus, with a view to finding its proper place among the bacilli. During the investigations, it was found that Ratin II, which is generally sold as a culture containing micro-oganisms that will cause a disease of rats, actually contained no bacteria, but was largely composed of an extract of squills. (From the *Experiment Station Record*, Vol. XXIII, p. 188.)

Reprints Nos. 104 and 105 of the Wellcome Chemical Research Laboratories, London, deal with the chemical examination of pumpkin and water melon seeds, respectively. According to these, analyses of the fatty oils obtained from these different seeds showed that the composition was very similar. Further, physiological experiments demonstrated that the supposed usefulness of pumpkin seed oil and resin for removing intestinal worms has no foundation in fact.

The Tariff Law of Jamaica, 1899, respecting the importation of articles into Jamaica, has been amended by a Law, No. 16 of 1910, dated June 30, 1910. As far as agricultural requisites are concerned, the new law, which remains in force until June 1, 1911, admits free of duty all machinery and engines, as was the case under the old one. It is different, however, in that wire and staples for fencing, and all iron required in connexion with roofing, are now admitted free, instead of being subject to a duty of 16⅔ per cent. on the value.

Information has been received, from Mr. C. Rey, of Anguilla, that there are two cotton ginning plants for sale in that island. The first of these consists of one 5 h.p. Cundall engine and two Asa Lees gins, the latter being practically new, having only made 30 bales of cotton last season; the plant includes line shaft with pulleys, bearings and belting, all in good order. The second plant is composed of one 7 h.p. Crossley's engine and two Asa Lees gins, with line shaft, pulleys, and bearings, and a baling press. These will be delivered, packed and f.o.b., on sloop in Anguilla, or Royal Mail Steamer in St. Kitts.

STUDENTS' CORNER.

READING COURSES EXAMINATIONS, 1910.

The examinations in connexion with the Courses of Reading instituted by the Imperial Department of Agriculture will begin during the present year as follows: Preliminary—Monday, October 10, at 9.30 a.m. (except in St. Kitts, where it will be held on Monday, October 17); Intermediate and Final—Monday, November 7, at 9.30 a.m. As before, the Preliminary Examination will consist of a written paper and an oral examination, and the Intermediate Examination will include two written papers—one dealing with general subjects and the other with special crop subjects—together with an oral examination conducted by members of the planting community, who have kindly consented to give the Department the necessary assistance. In both cases, the oral examination will be held at such a time (or times) as is most convenient. Three hours will be given for the Preliminary paper, when nine questions out of thirteen that will be given may be attempted. For the Intermediate paper, dealing with general agricultural science, two hours will be allowed for answering eight questions, which is the greatest number that may be attempted, out of a choice of twelve.

As this is the first occasion on which there is a likelihood that any candidates will offer themselves for the Final Examination, it will be well to consider, at some length, the scope of this, as well as the way in which the questions should be viewed by the candidate, in relation to his supplying answers to them.

It is intended that the Final Examination shall consist of three parts: a paper on general subjects, a paper on special subjects, and an oral examination conducted by members of the planting community; so that it will be similar, in its broad outlines, to the Intermediate Examination. It will be very different, however, as regards the way in which the questions are to be answered. The candidate will be required to recognize thoroughly the necessity for a broad treatment of the subjects with which he will have to deal, with special attention to the knowledge that he has gained in his practical experience. He is supposed to have learned already most of the facts of agricultural science that will be of use to him, during the time that he was passing through the Preliminary and Intermediate stages, and the purpose of the Final Examination is to find out if he is capable of making practical use of these facts, as well as to gain some idea of his usefulness on an estate of the kind on which he has received his training. The necessity for keeping continually before his mind the conditions of the estate practice with which he has been familiar, and for employing these in illustrating his answers, is especially important when he is answering the questions in the paper on general subjects. The greater the extent to which he can quote examples arising from the cultivation and preparation of the crops with which he has been acquainted intimately, the greater will be the value of his answers. As has been indicated already, he will find it of much assistance if, while providing those answers, he keeps well in mind the practices and conditions of the estates on which he has worked.

In the paper to be set on special subjects, in the Final Examination, the choice of these subjects will be guided entirely by that which the candidate made for the Intermediate Examination. That is to say, for instance, a candidate who has obtained an Intermediate certificate showing a satisfactory knowledge, for that stage, of cacao and lime cultivation, must offer the same crop subjects (cacao and limes) in the Final Examination, and the same circumstance applies to sugar, cotton and provision crops, which must be followed by sugar, cotton and provision crops, respectively, in the Final Examination. In the matter of the paper itself, as the knowledge to be shown in the special subjects will have to be wide and detailed, a large amount of time will be given for answering the questions, in order that candidates may have the opportunity of showing the degree of thoroughness with which they are capable of dealing with them.

It remains to be pointed out that a commencement of setting specimen questions, for guidance in connexion with the Final Examination, was made in the last number but one of the *Agricultural News* (No. 218). This will be continued, and the attention of candidates in the Final stage is specially directed to such questions, in order that these may serve as a guide to the kind of tests that they may expect, and that an opportunity may be afforded of practising the writing of answers to such questions according to the principles indicated above. In the present issue, these are as follows:—

(1) What capital and what number of labourers do you consider to be required for raising cotton on 50 acres?

(2) Give an account of the extent to which animals are useful, in relation to one important crop.

(3) What are the general matters to be taken into consideration in packing estate products for export? Illustrate your answer by means of facts relating to a crop with which you are familiar.

USES FOR DYNAMITE IN AGRICULTURE.

Dynamite has been pressed into the service of the agriculturist, chiefly on account of its usefulness in providing a substitute for laborious and expensive digging operations. The fact that it can be employed in this way is of the greatest importance in countries where labour is dear, or where it is imperative that ground should be prepared quickly for agricultural operations. Among the more common modes of employment of dynamite in this way are those which include the removal of tree stumps, the felling of trees, the blasting of boulders, and the removal of hard-pan, which is the hard impervious layer that forms beneath certain soils and which, through preventing proper drainage, causes them to become water-logged.

The particulars as to the manner in which dynamite is employed for these purposes are contained in a series of pamphlets issued by the E. I. Du Pont de Nemours Powder Co., Wilmington, Del., U.S.A. In regard to removing tree stumps, the method suggested for blasting stumps of the southern pine may be given as an example. The earth is taken out underneath one side of the stump, until the main root is found; an opening 1 foot deep is dug near this, and a hole 2 inches in diameter is bored into it, at a place 1 foot below the surface line, and at an angle of 35° to 40°. After the charge has been inserted and exploded, the stump is removed to about 2 feet below the surface. In a careful record which was kept of work of this kind, it was found that 325 stumps, averaging 28½ inches in diameter, were removed at a cost, including dynamite, fuse, and blasting caps or electric fuses, of a little more than 18c. per stump. For felling trees, the method of procedure is similar to that employed for blasting stumps.

The blasting of large boulders is carried out by drilling a hole in them from 10 to 20 inches deep, according to the nature of the rock, and using a charge of 1 to 2 lb. of dynamite, after tamping. The removal of hard-pan is effected by means of charges exploded in holes drilled in it, at in-

FUNGUS NOTES.

SOME DISEASES OF RUBBER TREES.

PART II.

STEM DISEASES. These, though numerous, are mainly confined to Hevea, with the exception of that caused by *Corticium javanicum*, Zimm., which also occurs on Castilloa in Java. The principal ones are as follows:—

Ceylon canker, attributed to *Nectria diversispora*, Petch; Ceylon bark disease, due to *Corticium javanicum*, Zimm.; Malay bark disease, due to *Corticium calceum*, Fr.; die back, due to *Gloeosporium alborubrum*, Petch, frequently followed by *Botryodiplodia elasticae*, Petch, black canker, in the Dutch East Indies, due to *Fusicladium* sp.; new bark disease, in the Malay States, due to *Diplodia rapax*, Massee; new stem disease, in the Malay States, due to *Eutypa caulivora*, Massee; a branch and stem disease, in the Malay States, not yet completely worked out, possibly due to *Corticium javanicum*; horse-hair blight.

All of these occur on Hevea. In addition, a disease of Funtumia similar to the canker of cacao in Ceylon, has been reported from Uganda; it is attributed to *Nectria funtumiae*, Massee. *Corticium javanicum* attacks Castilloa in Java, and *Botryodiplodia elasticae* has been found on certain specimens of the same plant which had previously been damaged by fire in Ceylon.

Ceylon canker on Hevea was described by Carruthers in the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. II, p. 446. The disease was discovered in November 1903, but was not of very wide distribution, so that the usual remedial measures for canker which were employed to control it were successful in almost eliminating it from the island. Though the term canker has been employed to describe it, no typical open wound is formed. There are no very definite external characteristics, except that the bark over the affected spot appears different from that over healthy tissue. It may be darker in colour, or split in a different manner. The diseased tissue below this bark is of a dirty yellow, or neutral tint, deepening, as the attack proceeds, to claret colour. No latex will flow from such parts. The causative fungus usually attacks the lower portions of the stem and the lower branches, but never occurs on the roots. The remedial measures consist, as usual, in excising the affected areas, and tarring the resultant wounds. The disease has been attributed to a species of Nectria, found on infected bark by Carruthers. This was also found on dead branches of tea, and on Hevea fruits by Petch, and named *Nectria diversispora*, Petch. The parasitism of the species does not appear to have been satisfactorily established. (Petch, Annual Report of the Mycologist, 1905, *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. III, p. 281, etc.)

The bark disease due to *Corticium javanicum* was described in the *Agricultural News*, Vol. IX, p. 286, and need not be further dealt with here, except to add that, in some instances where the development of the fungus is checked, the wound often becomes surrounded by callus, and in this way an appearance is caused which is very similar to that of canker. It is interesting to note that some authorities consider *Corticium lilacino-fuscum*, B. and C., as identical with *Corticium javanicum*, in which case care should be taken in these islands to keep pink disease of cacao well in check, for fear the causative fungus may spread to Hevea, on which host it seems to be capable of causing considerably more serious damage than on cacao. References to this disease may be found in the *Agricultural News*, loc. cit.; also, Bernard, Bulletin XII, p. 21, du Département de l'Agriculture aux Indes Néerlandaises; Zimmermann, *Mededeelingen uits Landsplantentuin*, LXVII, p. 51; and *Bulletin de l'Institut Botanique de Buitenzorg*, X, 1901.

The Malay bark fungus, *Corticium calceum*, Fr., is known as the writing fungus, because the patch formed by it often splits up in a manner suggestive of hieroglyphics; its general effect is very similar to that of *C. javanicum*, as has been pointed out before (*Agricultural News*, Vol. IX, p. 286, where further references are given).

Die-back disease, which occurs in Ceylon, has already been described in the *Agricultural News*, Vol. IX, p. 270, and, as it was considered at some length, it need not be further mentioned here.

The black canker disease in the Dutch East Indies appears on the branches of trees that have been pruned, and on the tops of pollarded trunks. It is not of very wide distribution, and should yield readily to treatment. The progress of the disease is as follows: the leaves wilt, turn yellow, dry up and fall; the flow of latex rapidly diminishes, and very soon ceases altogether. A few days later, the tree is dead. In some cases, however, only the upper parts die, and the tree puts out branches from below the diseased area. The bark of the parts attacked splits, and scales off, and between it and the wood the mycelium of the causative fungus appears as a blackish down. Among the hyphae of this mycelium, the brown bicellular conidia of a species of Fusicladium may be found. The hyphae themselves are brown, septate and branched; after destroying the bark, they penetrate the young wood and give it a dark colour. As preventive measures, Dr. Bernard, by whom the disease was first described, recommends careful tarring of wounds made in pruning, and filling of the central hollows in the trunks after pollarding. When the trees are not dead, the whole of the diseased portion, as indicated by the colour of the wood, should be removed and burned, and the wounds so made tarred. (Bernard, Bulletin XII du Département de l'Agriculture aux Indes Néerlandaises.)

In the *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. VIII, p. 310, an account is given by the editor, Mr. H. N. Ridley, M.A., of a black fungus occurring on Hevea in Perak; the disease was also reported a little later from Selangor (loc. cit., p. 521). The attack commences on the shoots, which turn black and die, and eventually the disease spreads to the trunk, and kills the tree. The bark of the branches affected shows numerous raised spots, which eventually split, and reveal the black fructifications of a fungus. Older branches show large elevated patches, of a black colour, looking as if soot had been thrown on the tree. The fungus kills the cambium and turns it black, and the wood soon dies; it is active during the wet season, but becomes stationary in dry weather. Diseased parts should be cut back to a point where latex flows healthily, infected material promptly burned, and the bark below the attacked areas treated with Bordeaux mixture. It is also suggested that spraying all trees in an affected district might prove useful. The fungus was first thought by Ridley to be a species of Cucurbitaria, but specimens sent to Kew were identified by Massee as a new species of Diplodia, and named *Diplodia rapax*. In making this identification, Massee remarks that the appearance of the fungus suggests that it is a stage in the life-history of a Rosellinia. This is interesting, as a species of Rosellinia has recently been found on Castilloa stems in Grenada. *Diplodia rapax* also occurs on Hevea in West Africa. (*Agricultural Bulletin of the Straits and Federated Malay States*, Vol. VIII, p. 570; *Kew Bulletin*, 1910, No. 1, p. 3.)

WEST INDIAN PRODUCTS

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of August :—

August in Mincing Lane, as well as in other business centres, is always a dull month, on account of the holiday season. In the absence of buyers there is naturally, but little inclination to bring forward any large consignments of new or old products, which by keeping back to a more suitable season might result in a much more advantageous return. Our report, therefore, for the month just passed, will necessarily be of a meagre description.

GINGER.

At the sale on the 10th there was a steady demand for Jamaica; 108 packages were disposed of at the following rates—good bold dullish 65*s.*, fair 60*s.* to 61*s.*, and good ordinary 53*s.* only small sales were made in Cochin and Calicut though about 600 packages were offered, 62*s.* being paid for small cut and scraped Cochin. Bold cut was bought in at 90*s.*, medium at 75*s.*, and small at 60*s.*, while rough brown Calicut was held at 55*s.*, and washed rough Cochin at 50*s.* per cwt. On the 17th the offerings amounted to 155 packages of Jamaica and 261 of good washed rough Cochin, none of which found buyers.

NUTMEGS, MACE, AND PIMENTO.

Little or nothing has been done in any of the above articles; the price of the latter has been from 2¼*d.* to 2⅜*d.* per lb., with very little demand.

ARROWROOT.

At auction on the 17th, 103 barrels of St. Vincent were offered, the whole of which were bought in at 2*d.* per lb. for fair manufacturing; on the other hand, some 21 cases of Natal were offered, and the whole of it sold at 9¼*d.* per lb. A week later, 30 half-barrels of Bermuda were offered, but none sold, 2*s.* per lb. being the reserved price.

SARSAPARILLA.

At the drug sale on the 11th, sarsaparilla was represented by 24 bales of Lima-Jamaica, all of which were bought in at 1*s.* to 1*s.* 3*d.* per lb., and 13 bales of native Jamaica. It was reported that this kind was so plentiful that there was but little demand for it, 1 bale only being sold at 9*d.* per lb. for dull red. At the auction on the 25th, 14 bales of grey Jamaica were offered and all disposed of at from 1*s.* 3*d.* to 1*s.* 4*d.* per lb. for fair to good. Two bales fair red native Jamaica sold at from 10*d.* to 11*d.*, and 6 bales of Lima-Jamaica, out of 21 offered, realized 10*d.* per lb. for roughish quality. A few bales of Guatemala and Mexican mixed were offered, and bought in at 8*d.* per lb.

LIME JUICE, KOLA, ETC.

At the beginning of the month there was but little business done in concentrated West Indian lime juice, the quotation for which was £18 10*s.*; quite at the end of the month, however, the price had fallen to £18 2*s.* 6*d.* Kola nuts were represented at auction on the 24th by 7 bags of fair West Indian, which were disposed of at 3*d.* per lb. The scarcity of the round Buchu leaves still continues. At the last sale at the end of the month 6 bales only were offered, the reserved price of 7*s.* being obtained for 1 bale only; an offer of 6*s.* 8*d.* for the rest being refused. Later it was stated that these had been disposed of at full rates, and for a few other bales that were anticipated 7*s.* 6*d.* would be the price fixed. There has been a decided decline in rubber. At the time of writing, hard fine Para is quoted at 7*s.* 11½*d.* to 8*s.* Vanilla continues to command firm prices, with good supplies, Madagascar 7½ inches fetching 14*s.* 6*d.*, and 7 inches 13*s.* to 13*s.* 6*d.* Seychelles 6½ to 7 inches, 13*s.*, and Mauritius somewhat split and foxy 11*s.* 6*d.*

THE PRODUCTION OF VANILLA, 1909-10.

The following particulars concerning the production of vanilla during 1909-10 appeared in the *Chemist and Druggist* for April 30, 1910. It is of interest in connexion with the note that appeared on the subject in the last number of the *Agricultural News* and with the article on page 52 of the present volume, entitled The Prospects of Vanilla Growing:—

Mr. Hermann Mayer, senior, sends these statistics of the 1909-10 vanilla-production:

	Tons.
Seychelles	10
Bourbon	35
Mexican	70
Comoros, Mayotte, etc.	40
Madagascar and Mossi-Bé	25
Mauritius	2
Ceylon, Java, Fiji, Zanzibar, etc.	10
Guadeloupe and Martinique	15
Tahiti	180
Total (say about)	390

This quantity falls 110 tons short of the 1908-9 crop, and, as Tahiti shows an increase of 40 tons, the actual deficiency in the finer qualities totals 150 tons, or 40 per cent. on the previous year's yield, which was of full average extent. Prices during the past twelve months have moved in accord with the statistical position, showing an improvement of 30 to 40 per cent. for all varieties except Tahiti; these have profited by the shortage of all other sorts and maintained their value, notwithstanding the larger returns. Only unimportant balances remain in the colonies, and, as new crops are unlikely to be landed in quantity before November next, statistically the position appears exceptionally sound.

ST. LUCIA AND THE CANADIAN EXHIBITIONS.

A letter, in a recent number of the *Voice of St. Lucia*, shows that the following classes of exhibits were sent to the Toronto Exhibition, as well as a duplicate set to the Dominion Exhibition, held at St. John: jellies and jams, crystallized sugar, muscovado sugar, Demerara crystals, centrifugal molasses, fancy molasses, condiments, Liberian coffee, fruits in spirits, fruits in formalin, cassava meal and starch, unfermented and prepared cacao, arrowroot, native made brooms, ropes, swizzle sticks and other useful articles, rum, beeswax, samples of native furniture woods, cocoa-nuts, decorative material, including cocoa-nut branches, bamboos and sugar-canes, together with 10 crates of green limes and 4 crates of bananas.

MARKET REPORTS.

London.—The West India Committee Circular September 13, 1910 ; Messrs. E. A. de Pass & Co., September 2, 1910.

Arrowroot—St. Vincent, 1¾*d.* to $2\frac{1}{16}$*d.*
Balata—Sheet, 3/4 ; block, 2/6 per lb.
Beeswax—£7 12*s.* 6*d.*
Cacao—Trinidad, 52/6 to 62/- per cwt. ; Grenada, 49/- to 53/-; Jamaica, 48/6 to 53/6.
Coffee—Jamaica, 41/- to 92/-.
Copra—West Indian, £28 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 58/- to 65/-.
Honey—24/- to 31/6.
Isinglass—No quotations.
Lime Juice—Raw, 10*d.* to 1/3; concentrated, £18 2*s.* 6*d.* to £18 5*s.*; Otto of limes (hand pressed), 5/9, nominal.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Steady.
Pimento—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
Rubber—Para, fine hard, 7/9, fine soft, 7/1½ ; fine Peru, 7/6 per lb.
Rum—Jamaica, 1/8 to 4/6.
Sugar—Crystals, 17/- to 19/6 ; Muscovado, 12/9 to 15/-; Syrup, 13/- to 14/-; Molasses, no quotations.

New York,—Messrs. Gillespie Bros. & Co., September 2, 1910.

Cacao—Caracas, 10¾c. to 11½c. ; Grenada, 10¾c. to 11c. ; Trinidad, 10¾c. to 11¼c. ; Jamaica, 9c. to 11c. per lb.
Cocoa-nuts—Jamaica, select, $34·00 to $36·00 ; culls, $18·00 to $19·00 ; Trinidad, select, $34·00 to $36·00 ; culls, $18·00 to $19·00 per M.
Coffee—Jamaica, ordinary, 10c. to 10¼c.; good ordinary, 10¾c. ; and washed, up to 12c. per lb.
Ginger—8¾c. to 11c. per lb.
Goat Skins—Jamaica, 56c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
Grape Fruit—$3·50 per box.
Limes—$6·00 to $7·00.
Mace—35c. to 40c. per lb.
Nutmegs—110's, 8¾c. to 9c. per lb.
Oranges—Jamaica, $2·25 to $2·50 per box.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·42½c. per lb. ; Muscovados, 89°, 3·92½c.; Molasses, 89°, 3·67½c. per lb., all duty paid

Trinidad,—Messrs. Gordon, Grant & Co., September 17, 1910.

Cacao—Venezuelan, $11·75 per fanega; Trinidad, $11·50 to $11·75.
Cocoa-nut Oil—$1·12 per Imperial gallon.
Coffee—Venezuelan, 10¾c. per lb.
Copra—$5·00 per 100 lb.
Dhal—$4·00 to $4·10.
Onions—$2·40 to $2·50 per 100 lb.
Peas, Split—$6·00 to $6·10 per bag.
Potatos—English, $2·00 to $2·10 per 100 lb.
Rice—Yellow, $4·70 to $4·75 ; White, $5·10 to $5·20 per bag.
Sugar—American crushed, $6·20 per 100 lb

Barbados,—Messrs. Leacock & Co., September 24, 1910; Messrs. James A. Lynch & Co., September 19, 1910.

Arrowroot—St. Vincent, $3·75 per 100 lb.
Cacao—$10·50 to $12·00 per 100 lb.
Cocoa-nuts—No quotation.
Coffee—Jamaica and ordinary Rio, $10·50 to $11·50 per 100 lb., scarce.
Hay—$1·40 per 100 lb., dull.
Manures—Nitrate of soda, $60·00 ; Cacao manure, $42·00; Sulphate of ammonia, $70·00 per ton.
Molasses—No quotations.
Onions—$2·50 to $3·00 per 100 lb.
Peas, Split—$6·25 to $6·30 per bag of 210 lb.; Canada, $3·45 to $3·50 per bag of 120 lb.
Potatos—Nova Scotia, $2·00 to $2·60 per 160 lb.
Rice—Ballam, no quotations ; Patna, $3·50 ; Rangoon, $2·90 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, September 17, 1910 ; Messrs. Sandbach, Parker & Co., September 16, 1910.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·50 to $8·00 per 200 lb.	$7·50 to $8·00 per 200 lb., mkt. dull
Balata—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
Cacao—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
Cassava—	80c.	No quotation
Cassava Starch—	None	No quotation
Cocoa-nuts—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
Coffee—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	14½c. per lb.	14½c. to 15c. per lb.
Liberian	8½c. per lb.	10c. per lb.
Dhal—	$3·65 to $3·75 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$4·60	——
Eddos—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	2¼c. to 2½c.	2½c.
Peas—Split	$6·00 per bag (210 lb.)	$5·75 to $6·00 per bag (210 lb.)
Marseilles	$4·25	No quotation
Plantains—	40c. per bunch	——
Potatos—Nova Scotia	$3·25 to $3·50	$3·00 to $3·25
Lisbon	——	No quotation
Potatos–Sweet, Barbados	$1·44 per bag	——
Rice—Ballam	None	——
Creole	$5·10	$5·00
Tannias—	$2·16 to $2·64 per bag	——
Yams—White	$3·00	——
Buck	$3·00	——
Sugar—Dark crystals	$2·70 to $2·75	None
Yellow	$3·00 to $3·25	$3·70
White	$4·00 to $4·10	$4·00 to $4·25
Molasses	$2·25 to $2·60	None
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $5·75 per M.	$3·50 to $5·50 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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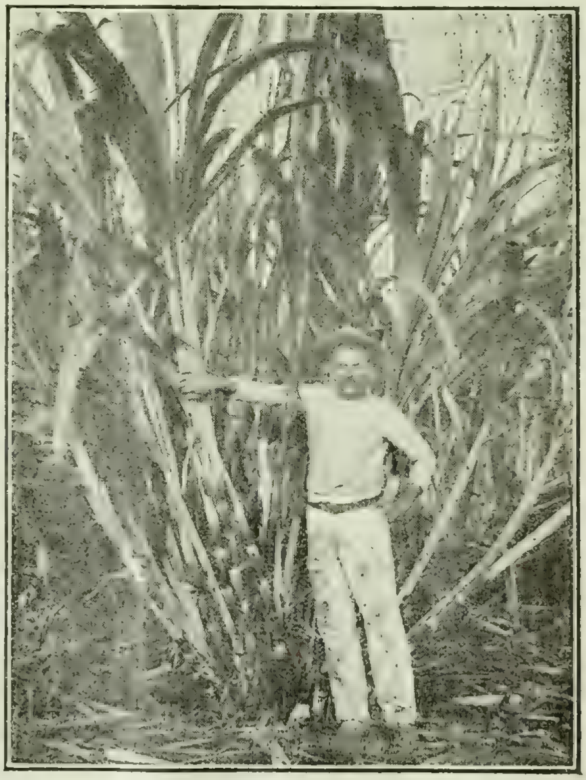

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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CONTENTS.

The Growth of Knowledge Concerning Soil Fertility.

SEVERAL editorial articles have been given in the current volume of the *Agricultural News**, which have dealt with subjects relating to the fertility of the soil. This matter is naturally of first importance to the agriculturist, whether he obtains his means of subsistence from the soil, or whether he is in the position of an adviser to those who do this. This is probably one of the reasons why the opening address in the agricultural sub-section of the British Association, this year, by A. D. Hall, M.A., F.R.S., Chairman of the Sub-section, dealt intimately with matters relating to this subject, more especially from an historical point of view. The main points brought out in this address are of sufficient interest to merit a recapitulation of them here.

It was pointed out, first of all, that the fertility of the soil was intended to signify the power which a piece of land possesses of producing crops, under cultivation. In the seventeenth century, which may be regarded as the time of the commencement of organized science, two important questions relating to this were receiving the attention of certain investigators. These asked for the causes of the increase in size of plants, and for knowledge concerning the share which the soil takes, in supplying material for such growth. The first recorded experiment devised to gain the information was made by van Helmont; in this, a willow tree weighing 5 lb. was planted in 200 lb. of dried earth, contained in a tub. On weighing the tree, after it had been growing in the tub for five years, it was found to have increased to 169 lb. 3 oz., while the redried soil only weighed 2 oz. less than it did at the beginning of the experiment. The conclusion obtained from the investigations was that water had been transformed into the material composing the tree, and this idea was upheld by Boyle, who grew pumpkins and cucumbers in weighed earth, and, going further, distilled the plants that he obtained, thus getting from them various tars and oils, charcoal and ash. There were at the same time, however, those who paid attention to the fact that spring water contains dissolved material which might assist in the growth of the

*Pages 17, 33, 193 and 289.

plant, but it was not possible, in the state of their chemical knowledge, to indicate the origin of the carbonaceous matter that is added to plants during their growth.

Experiments dealing with the nutrition of plants were nevertheless continued, for in 1660, Sir Kenelm Digby, lecturing before the Society for Promoting Philosophical Knowledge by Experiment, described a trial in which the growth of young plants of barley was increased by watering them with a weak solution of nitre. Mayow, of the University of Oxford, went further and drew attention to the fact that the added nitre must feed the plants, under such circumstances, because none of this substance could be extracted from soils. Others who were interested in the growing of plants confirmed the observations as to the increased fertility of the soil to which this salt had been added; but for various reasons, no more definite knowledge on the subject was obtained for some time.

It was not until the nineteenth century, after the work of Priestley, Lavoisier, de Saussure and others had shown what is the true composition of the air, that it was possible to gain any further knowledge as to the way in which plants feed and grow. Attention was given at first to the humus in the soil, and it was concluded, from the increased growth of plants in soils rich in this, that their carbonaceous content was obtained from it. By about 1840, however, the results of investigations had arrived at a point at which it was possible to state definitely that the carbon in plants comes from the air, and the nitrogen and ash from the soil. It is to Liebig that the agriculturist is indebted for the general acceptance which was gained by this broad theory of plant nutrition, as well as for most of the influence which now makes agricultural chemistry a matter of exact science.

Enough was known at this stage to suggest that, as the supply of material in the air giving the plant its carbonaceous matter is inexhaustible, the state and composition of the soil must be the responsible factors in influencing the growth of plants. In relation to this, the enormous difference that exists between the amount of plant food in the soil and that taken out by a crop was first pointed out by Daubeny, Professor of Botany and Rural Economy at Oxford, and the real founder of the science of agriculture in England. It was this investigator who first showed experimentally that any normal soil 'contains the material for from fifty to a hundred field crops'. Considerations of the limit of the growth of plants, even in the presence of such large amounts of food, gave rise to the conception of available and unavailable plant food, and Daubeny attempted to find a means of gauging the amount of the former by treating the soil with water containing carbon dioxide. He did not obtain conclusive results, however, and this has been the experience of others who have adopted the same line of experiment, using different acids, such as citric acid, instead of a solution of carbon dioxide in water. The reason for this general failure is that such investigations only determine one factor in soil productivity; there are others*, as is well known, which must be considered to an even greater degree, in order to arrive at a true estimate as to its causes.

Other suggestions that have been made, especially in recent years, for the purpose of explaining the differences in productivity of soils may be passed over, as they are at present matters under discussion. It is only necessary to make mention of the theory put forward by investigators in the United States to the effect that infertility of soil arises from the presence of toxic bodies that have been formed in it already by plants. Daubeny had given attention to this theory in 1845, when he produced objections to it that are valid at the present time. There is the additional objection that, although sterile soils have been shown to contain certain organic bodies that may be toxic to plants, there is nothing to indicate that fertile soils do not contain these in an equal degree.

It remained for Schlösing and Müntz, Warington, and Winogradsky, within the last thirty years, to show that nitrates are produced from organic compounds and ammonia in the soil by the action of two bacteria, called usually the nitrifying organisms, neither of which can complete the work without the presence of the other. This suggested the importance of thorough cultivation of the soil, in order that these organisms may find themselves among the conditions of aeration and moisture that will conduce to their greatest activity, and therefore to the quickest formation of nitrates.

The next step in progress was made when it was discovered by Hellriegel and Wilfarth, in 1886, that certain bacteria actually assist in the addition of nitrogen to the soil, by living in the nodules of leguminous plants, to the latter of which they transfer nitrogen taken from the air. The importance of this mode of adding nitrogen to the soil is too well known to require further comment in the present connexion.

The results of such investigations drew attention to the micro-organisms that live in the soil, and their

* See *Agricultural News*, Vol. IX, p. 257.

study resulted in the discovery of the nitrogen-fixing organism, Azotobacter, which without the aid of living plants, and in the presence of an adequate supply of organic matter, forms a means of directly adding nitrogen to the soil. In connexion with this, experiments at Rothamsted have shown that, while soils containing little organic matter experience a small addition, if any, to their nitrogen content through direct fixation, those possessing an adequate amount of organic matter may have nearly as much as 100 lb. of nitrogen per acre added to them, yearly.

In face of the dependence which the fertility of soils was found to show on the presence of micro-organisms, it was hard to explain why the exposure of soil to conditions, such as heat and various poisons, which would kill these organisms, always resulted in an increase of its fertility. It was not until the recent investigations made by Drs. Russell and Hutchinson at Rothamsted showed that the soil contains organisms (protozoa) much larger than bacteria and, curiously enough, closely related to the white corpuscles in the blood which enable the body to fight disease; these organisms feed on the bacteria in the soil. The investigations in connexion with them were given attention recently in the *Agricultural News* (Vol. IX, p. 34), and it only remains to say that they showed that the effect of the exposure of the soil to moderate heat, or to certain poisons, was to kill these protozoa, and thus to give the best chance for the increase in numbers of the bacteria, in this way enhancing the rate of nitrogen fixation.

The conclusion reached after these considerations is that the cause of the fertility of the soil cannot be looked for in one factor alone. Several circumstances subscribe to it, and the absence, or insufficient presence, of any one of these will prevent the others from exerting their proper effect. The object of investigations in connexion with the productivity of soil is to ascertain the nature of these factors, and to find means of bringing them under proper control.

The *Financial Times* of June 9, 1910, contains a letter written with the object of contradicting reports, that have been put into circulation, to the effect that the trees of Ceara rubber (*Manihot Glaziovii*) only live for a short period, and that they are not sufficiently hardy to withstand untoward conditions for any length of time. Figures are given to show that, in German East Africa, an average of about ½-oz. of wet rubber per tree was obtained from plants three years old, in a dry season, in a district having a rainfall of 56 inches in the year. In older plantations, trees from thirteen to nineteen years old were still producing latex in large quantities, and even plants that had been attacked by white ants, and had broken down, grew again and formed new trees.

CONCRETE POSTS ON ESTATES.

In reply to a request from the Imperial Commissioner of Agriculture, Mr. A. St. G. Spooner, of Bendals estate, Antigua, has kindly supplied information arising from his experience in the making of reinforced concrete posts for use on estates, and relating to the utility of such posts as regards the purposes for which they are required.

After describing his original, unaided attempts to make such posts, Mr. Spooner draws attention to the fact that the Pettyjohn Company, of Terre Haute, Indiana, U.S.A., makes a portable moulding frame for the purpose of manufacturing them. This frame is placed on a board, and the concrete mixture is rammed into it; while it is being filled the reinforcing strips are set in the mixture—one about ¾-inch from the bottom of the mould, and the other at the same distance from the top of it. When the mould has been filled with material, which is tightly rammed, the top of this is smoothed off with a trowel, the pins which held the reinforcing material are pulled out, and the whole mould is lifted away from the concrete by means of handles at each end. The posts are left undisturbed for a whole day, at least; a better time is two days; they are then stacked endwise, covered with trash and allowed to remain moist for a week or two, until they have hardened thoroughly. The posts that are being made at present by Mr. Spooner are 6 feet long, and measure $5 \times 4\frac{1}{2}$ inches at one end, and 5×3 inches at the other.

The mixture used in making the concrete is 4 parts of coarse grit sand, clean and sharp, to 1 part of Atlas cement. Good posts can also be made with mixtures of finely broken stone (½-inch cube), sea sand and cement, in the proportion 4 : 2 : 1; but the appearance of these is not as good as that of the others. In the former mixture, 21⅓ lb. of cement is required for each post; this is mixed with 1,805 cubic inches of sand, loosely measured in a box. The mixture occupies 1,350 cubic inches, when rammed into the mould. British cement is probably better for the purpose than American cement, but the latter is cheaper.

Mr. Spooner gives figures showing the cost of making one post, with cement at 13*s.* a barrel; these are as follows:—

	Pence.
Cement	8·66
Sand (say)	0·50
Labour (by contract)	1·75
Reinforcing material (about)	2·50
Total cost	13·41

Each post thus costs about 1*s.* 1½*d.*; this would be reduced by 1⅓*d.* if cement was admitted free of duty in Antigua. The labour required for making the posts is provided by two men and a boy, and the output per day is from thirty to thirty-six posts. The mould, however, could turn out about 100 posts per day, if it was kept supplied by the mixture.

The reinforcing material consists of steel strips having considerable tensile strength, 1⅛ inches wide and $\frac{3}{16}$- inch thick, embedded in the posts as described above. The freight of these and the waste in cutting increase their cost, and Mr. Spooner suggests that a substitute may be found for them in the shape of four pieces of stout steel fencing wire, not less than No. 8 B.W.G., with the ends turned over to prevent slipping; these would be placed at the corners of each post about ¾-inch from the outside.

In erecting the posts, experience has shown that the best method is, first of all, to make taut between the straining posts the wire which they will have to carry, and then to fasten it to them, by passing a short length of wire through the holes left in the post, and twisting the ends tightly round the fence wire, by means of a key.

FRUITS AND FRUIT TREES.

THE PRODUCTION OF CACAO IN 1909.

The *Journal d'Agriculture Tropicale* for July 1910 (No. 109) gives an account of the statistics, published in *Gordian* for June 22, of the production and consumption of cacao in 1909. The following particulars as to the former of these are taken from that account, commencing with figures showing the production of cacao in 1908 and 1909, in tonnes of 1,000 kilos. (2,205 lb.), which may be taken as being roughly equivalent to the ordinary ton:—

	1908.	1909.
Brazil	32,960	33,730
Equador	32,120	30,650
San Thomé	28,560	29,620
Trinidad	21,740	23,260
British West Africa	14,260	22,470
Venezuela	16,300	16,890
San Domingo	19,010	14,820
Grenada	5,110	6,360
Ceylon	2,840	3,590
German Colonies	2,740	3,400
Jamaica	2,690	3,210
Hayti	3,150	2,800
Fernando Po	2,270	2,670
Dutch Indies	2,340	2,450
Cuba	860	1,940
Surinam	1,700	1,900
French Colonies	1,420	1,500
St. Lucia	610	700
Belgian Congo	610	700
Dominica	480	500
Costa Rica	340	500
Other countries	1,000	1,000

The article proceeds to point out that several interesting facts may be gleaned from the tables given in *Gordian*. Firstly, there has been an increase in the world's production, or more properly, export, amounting to 10 million kilos. in 1909. In the last decade, 1899-09, the production has moved from 99,886,649 kilos. to 204,660,000 kilos.; that is to say, it has more than doubled, implying an average increase of 10 million kilos. a year.

Brazil retains its position at the head of the different cacao-producing countries with an excess of about 800 tons over the amount for 1908, which, unfortunately, was not accompanied by a corresponding increase in the value of the products; the average price of a kilogram of cacao fell from 959 reis (1 reis = ·027*d.*) in 1908 to 754 reis, in 1909—from $11\frac{1}{2}$*d.* to about 9*d.* per lb.—entailing a total diminution of 9,500,000 francs (about £375,000). The export from Brazil is supplied to a great extent by the State of Bahia, which furnished 28,783,000 kilos. in 1909; this was followed by Para with about 3,783,000 kilos.

San Thomé continues to increase its crop by more than a thousand tons, and its product is becoming more appreciated, being prepared with much more care than that of Brazil and of Guayaquil.

The very great impetus given to the cultivation of cacao in British West Africa shows itself by a fresh increase, by two-thirds, on the crop of the previous year. This large extension, and the small amount of care that is exercised by the natives in regard to the establishment and the maintenance of the plants, have not failed to gain the attention of Mr. H. N. Thompson, Conservator of Forests of Northern Nigeria, who points out, in a recent report to the Colonial Office, that it is much to be feared that the cacao plantations that have been established on the hills rising from the plain are liable to destruction, in the near future. The vegetation of the cacao is already losing, in some respects, its character of persistence; the trees are becoming deciduous, and the changes that are taking place are so pronounced, that the Director of Agriculture estimates that, in these places, the life of the trees will not exceed six or seven years. This is one of the consequences of excessive deforestation, which is threatening the palm oil industry in the same way.

The increase in the production of the German colonies is very noticeable. This is from 2,840 to 3,400 tonnes, of which quantity 2,800 tonnes came from the Cameroons. (*Deutsche Kolonial Zeitung*, 1910, p. 379.) Attention may be also drawn to the slight improvement in conditions in Surinam, where cacao is far, however, from having regained the position that it occupied in 1895, before the ravages of the witch broom disease took place. As regards the French colonies, production remains much at the same level, or shows a slight increase.

The world's consumption of cacao, particularized in the second table in the article in *Gordian*, has increased in a proportion that is much the same as that of the production, and the visible stocks, at the end of 1909, were approximately as follows: France, 20,070 tonnes; England, 9,150; Lisbon, 6,430; other countries, 34,340 tonnes. Finally, the floating cargoes figure in the statistics as 20,740 tonnes.

GREEN MANURES FOR WET LANDS.

The *Tropical Agriculturist* for March 1910, p. 258, reproduces the following information, concerning suitable plants for green manures on wet soils, from the *Madras Agricultural Calendar*, March 1910:—

SUNN HEMP (*Crotalaria juncea*). This is perhaps grown more largely than any other green manure crop. Every year large areas are grown in the Kistna and Godavari deltas. The seed is sown just before the paddy is harvested, and the crop is cut when 4 to 5 feet high. It is cut at about a foot from the ground, and the stubble is allowed to remain and grow again. The tops are dried, and make excellent fodder. The sunn hemp, however, on account of its extraordinarily rapid growth, can be utilized in many places and under other conditions. In six weeks the crop will attain a height of 3 to 4 feet, if the ground is moist. Thus, on wet land, where water is always available, or on wet lands where the seed beds are not prepared until water is available, or again on wet lands under tanks where the latter have been filled by early rains and the season for transplanting has not arrived—under all these conditions sunn hemp can be grown. On the Tanjore delta excellent crops can be raised after the receipt of water in the channels in time to plough in before the seedlings are ready. Again, the heavy summer rains which last year fell in many districts filled many tanks which did not expect their supply till June-July. On the Coimbatore Agricultural Station advantage was taken of this water to grow an excellent crop of sunn hemp, which was ready to be ploughed in by the time the seedlings were ready to transplant. On the West Coast also this can be grown with the April-May rains, and will be ready to plough in by the time transplanting commences. When grown on only a small scale, people who try this for the first time are apt to be disappointed, as the crop is very liable to be eaten by caterpillars; but on a large scale of 3 to 4 acres, the attack is much less. This remark applies to nearly all green manure crops. Some trial fields are often the only green crop in the neighbourhood, and therefore, are very liable to be attacked by insects; but when once the practice becomes wide-spread, so do the insects, and the attack is not so severe.

INDIGO (*Indigofera tinctoria*). This is a very useful crop to grow for green manure. It is very drought-resistant, and at the same time will grow on heavy land even when it is wet, but it will not thrive on land at all saline. It is now largely grown on the Cauvery delta. The seed of this crop can be sown at the time of the harvest of the samba crop. If there is sufficient moisture in the soil for germination, the land can be ploughed and sown as soon as possible after harvest. If it is too dry or too sticky, the seed can be sown a week or two before the paddy harvest, provided the water has been drained off. In the Perambalur taluk there is an excellent practice on tank lands of sowing Indigo with cumbu (bulrush millet—*Pennisetum typhoideum*) and irrigating from wells. The cumbu, when ready for harvest, is cut, and the indigo is allowed to grow, and gives an excellent crop. This is ploughed in at the time of transplanting the samba crop.

COWGRAM (*Dolichos* sp). This promises to be a very useful green manure crop on the West Coast. It grows quickly, and is not so liable to insect attacks as sunn hemp. It can be sown with the April-May rains, and will have grown sufficiently to plough in by the time transplanting commences in June-July.

GROUND NUTS (*Arachis hypogaea*). This also promises to be a very useful green manure crop on the West Coast, on single crop lands which are harvested in October. The land can be ploughed after the paddy harvest, and the seed sown behind the plough. The crop should give sufficient nuts to pay for the cultivation expense, while the tops can be ploughed in. This has been tried most successfully at the Taliparamba Agricultural Station, and under similar conditions in the neighbourhood, but it has yet to be proved whether it will do equally well on the lighter and more exposed lands near the coast, which do not get the nightly dews which are experienced in the valleys.

DHAINCHA (*Sesbania aculeata*; see *Agricultural News*, Vols. VIII, pp. 271 and 331; IX, pp. 124, 185 and 297). This plant will prove very useful on lands which are liable to flooding, or are badly drained or slightly saline. It grows to a height of 6 to 8 feet, and will continue to grow for several months. It can, however, be ploughed in within four months if necessary. This should prove very useful in the Cauvery delta on such lands which are too wet to transplant with the first crop.

MANUFACTURE OF PAPER FROM MEGASS.

The *Bulletin of the Imperial Institute*, Vol. VIII, p. 151, contains an abstract of a paper read by Professor P. Carmody, Director of Agriculture, Trinidad, at the recent International Congress of Tropical Agriculture and Colonial Development, at Brussels, on the manufacture of paper from megass. This abstract is reproduced below. Reference may be made to another article dealing with the subject, in the *Agricultural News*, Vol. IX, p. 247.

Attention has been directed at various times to the possibility of utilizing 'megasse', or sugar-cane refuse, for paper-making, and as long ago as 1839 a process for the purpose was patented. Since that time, little advance has been made, and the megasse is generally used as fuel for heating the boilers in the sugar factory. The question was again brought into prominence when the late Mr. Bert de Lamarre, of the Tacarigua Factory, Trinidad, announced that he was able to convert megasse into paper of fairly good marketable quality. It was found that the crude crushed fibre was too bulky to permit of its exportation being profitable, and it was therefore decided either to convert the material into 'half-stuff' before shipment, or to manufacture paper from it locally.

A modern well-equipped paper-making machine has therefore been imported and erected, and has hitherto been used for carrying out experimental trials. These have shown that paper of better quality can be obtained by blending the megasse with other fibrous materials, such as banana leaves and stems, maize residues, Agave, Hibiscus; bamboo, 'bois de canon' (*Cecropia peltata*), sunflower, native grasses, and other products. The best results have been obtained from a blend of megasse, bamboo and Para grass.

It is estimated that for every ton of cane sugar produced there is a ton of fibrous refuse, and hence in Trinidad, there are 50,000 tons of fibrous material available per annum. This amount would probably yield 40,000 tons of pulp, worth at least £200,000. If a better class of paper pulp was prepared, the yield would possibly be reduced to 30,000 tons, worth £12 per ton, or a total of £360,000; or if the megasse was blended with bamboo and Para grass, the pulp would be worth £15 per ton or a total of £450,000. Much of the paper could no doubt be used locally for wrapping purposes. The utilization of sugar-cane refuse in this manner is regarded as well worthy of consideration by those engaged in the cane sugar industry.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 26, with reference to the sale of West Indian Sea Island cotton:—

West Indian Sea Islands have been rather neglected since our last report, as buyers are waiting to see the price at which American Sea Island cotton is likely to rule before buying freely.

The sales were at first confined to about 40 bales of stained cotton at $9\frac{1}{4}d.$ to $12d.$ per ℔. Later 150 bales were sold; they comprised Jamaica, St. Croix, Anguilla, Virgin Islands and Barbuda, at $18d.$ to $18\frac{1}{2}d.$, and a few Barbados at $19d.$

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 24, is as follows:—

There have been no receipts of the new crop as yet, and owing to the backwardness of the crop it may be a fortnight before it commences to come to market.

COTTON-GROWING IN EGYPT.

Mr. Lawrence Balls, the Economic Botanist to the Khedivial Agricultural Society, has just published an important statement with reference to the suspected connexion between the repeated partial failures of the Egyptian cotton crop and the cumulative water-logging of subsoil. The present appearance of the Egyptian cotton crop is excellent. The acreage is unusually large, and the plant promises well. The Government has prolonged the period of restricted water-supply to the cultivators, but it is feared that the level of the water table and the condition of the subsoil are such as may yet cause a rapid deterioration in the condition of the plants. In Mr. Ball's opinion the collapse of the 1909 crop was principally due to the accumulation of water in the subsoil, raising the well-level or water table, and so leaving insufficient soil for healthy root development. A geologist, a mathematician, two chemists, an entomologist, an engineer, several agriculturists, and a cotton expert are all contributing their special researches in the elucidation of a problem in economic botany which, in its elaborate simplicity and commercial importance is, says Mr. Balls, almost unique. All these investigations converge upon one object, namely, a better understanding of the root system of the cotton plant, and of the effect produced on the crop by insufficient or interrupted root development. Mr. Balls points out that important changes in the soil brought about by water-logging year after year must give rise to a residual effect. The mischief done is cumulative and persistent, and 'the excessive water-supply of 1909 may be expected to cause some injury to the 1910 crop, even though the water-supply in 1910 be not excessive. In other words, land which has been water-logged should be expected to go through a period of convalescence, and not to make an immediate recovery when the water table is lowered.' It would seem from this that, notwithstanding the continuing of the rotations a month beyond their usual time this year, and the present favourable appearance of the crop, the certainty of a bountiful crop is by no means as yet ensured. (The *Journal of the Royal Society of Arts*, September 2, 1910.)

EAST AFRICAN COTTON.

A special effort is about to be made near the banks of the river Juba, in East Africa, to grow cotton, and a concession has been made to a syndicate for this purpose. It is claimed that the land in question will produce a large quantity of cotton per acre, equal in quality to Egyptian staples. There are good transport facilities in the neighbourhood of the selected area, and excellent means of irrigation can be provided. The Juba is similar to the Nile in overflowing its banks periodically, and leaving deposits of soil containing good fertilizing properties. The scheme has not yet been put into operation. (The *Textile Mercury*, September 3, 1910.)

COTTON EXPERIMENTS IN THE TRANSVAAL.

The first crop of Transvaal cotton has been picked at the Rusterberg Experimental Farm, and it is stated by Government experts that the crop, as compared with a similar variety grown in the United States, comes out well. The entire crop was excellent, the initial picking yielding 260 ℔. per acre. Some of the bolls have been publicly exhibited, and described as being exceptionally fine. The whole experiment shows that cotton can be produced in the Transvaal equal to, if not better than, American cotton, and, it is alleged, under pleasanter climatic conditions than those which prevail in the States. (The *Journal of the Royal Society of Arts*, August 26, 1910.)

Cotton Exports from St. Vincent.—The amount of cotton exported from St. Vincent during the quarter ending September 30, 1910, was 4 bales, of a weight of 1,440 ℔., and having an estimated value of £114. All this cotton was Sea Island, and was sent to the United Kingdom.

On the receipt of the returns from the other West Indian colonies and British Guiana, the details of the total amount of cotton exported during the quarter mentioned will be published in the *Agricultural News*.

ST. LUCIA: REPORT ON THE BOTANIC STATION, AGRICULTURAL SCHOOL AND EXPERIMENT PLOTS, 1909-10.

The financial statement made at the commencement of this report shows that the total expenditure in connexion with the Botanic Station and Special Agricultural Services, during 1909-10, was £723 14*s.* 5*d.* This sum, which is £60 9*s.* 2*d.* less than that of last year, included £398 3*s.* 11*d.* received from the Imperial Grant-in-aid. The receipts from the sales of plants, trees and flowers were £30 11*s.*

The station has been maintained in good condition, although the state of the northern part of it is not satisfactory, because of the flooding of the land from time to time, and it appears that improvements in the direction of raising the land and walling the drains are required, in order that this portion of it may become useful.

The extent of the distribution of economic plants from the nurseries at the Botanic Station and the Agricultural School continues to increase. The share of the latter institution in this is much greater than that of the former, as is shown by the fact that, in a total distribution of 77,557 plants, 73,353 were sent out from the Agricultural School. These figures do not include those relating to the distribution of seed and cuttings.

The rainfall for the year was 85·43 inches, the three wettest months being June, August and October, with 10·20, 13·44 and 10·32 inches, respectively. The highest temperature measured was 92°, on August 16, while the lowest was 62·0°, on March 2.

During the year, a scheme of prize-holdings competitions has been introduced into the island, particulars of which are published as an appendix to the report. Other work of an educative nature has included the provision of assistance in relation to the pursuit of nature study in the elementary schools, and the giving of aid to those taking the examinations held in connexion with the Courses of Reading of the Imperial Department of Agriculture.

The report includes interesting notes on soil examination, and on insect pests and fungus diseases, especially in relation to the control of the former of these. It is hoped that the information obtained by the carrying out of soil examination will be of the greatest use, eventually, in giving information as to the suitability of lands in the different parts of the island for the growing of cacao

The expenditure on the Agricultural School, during the year, was £688 10*s.* 3*d.*, excluding the emoluments of the officer in charge. There was a monetary return of £151 8*s.* 1½*d.* from the sale of plants, produce and live stock. The report on the school shows that satisfactory progress has been made, and that the discipline and health of the pupils are good. Three new boys were admitted during the year; ten pupils were discharged after completing their course of training, and two as physically unfit.

The report proper concludes with interesting details in relation to oranges, Para rubber, Central American rubber, seedling canes, Bengal beans, mangos and cacao, grown on the experiment plots. As regards the last named crop, a scheme of experiments in various kinds of cultural treatment has been formulated. The information in regard to live stock shows that this has filled a position of usefulness in the island.

Reference has been made already to the appendix containing details of the prize-holdings scheme. There are two other appendixes, the first of which contains a report on lectures in elementary agricultural science given by the Agricultural Superintendent to teachers in the primary schools; the second presents a report by the Agricultural Superintendent on the teaching of agriculture in such schools during 1909. These show that a great deal of assistance is being given by the Department of Agriculture in St. Lucia with the teaching of nature study and the principles of agriculture in the primary schools.

TORTOLA: REPORT ON THE EXPERIMENT STATION, 1909-10.

The expenditure at this station during 1909-10 was £598 0*s.* 3*d.*, which is an increase of £98 15*s.* 10*d.*, caused by the effecting of several improvements and additions to the station. The sum was provided by the balance brought forward at the end of the preceding period; it included £14 0*s.* 5*d.* decrease in the expenditure from the Imperial Grant-in-aid. The receipts from the sale of produce, old stores, and from the rent and sale of land, amounted to £88 10*s.*

The improvements and additions at the station related chiefly to the sugar and cotton industries, and to the water-supply. As regards the distribution of plants, there was little demand during the year, notwithstanding the fact that this is free. The amount of cotton seed sent out from the station was 957 lb., sold at 4c. per lb.

The details given in relation to the experiment plots show that these were occupied by cotton, sugar-cane, sweet potatos, cassava, limes, pine-apples, cacao, coffee and arrowroot. Among the results obtained in these experiments are the indication of the advisability of the earlier planting of cotton, and that of the special suitability of the seedlings B.147, and B.208, under certain circumstances, to conditions in Tortola. There are signs that the export trade in sweet potatos and limes is increasing; as regards cacao, it seems that this may eventually be grown for shipment to a limited extent. The local demand absorbs, at present, all the cassava, pine-apples and coffee produced.

The rainfall of the period was exceptional, being 64·12 inches, while the average at the experiment station for the last nine years was 54·49 inches. The increased annual precipitation was mainly due to heavy rains in November.

An interesting appendix to the report treats of the cotton, lime and sugar industries. A check has been received by the first of these because of low prices and unfavourable weather, but this is likely to be only temporary. Limes, as well as cotton, are purchased by the Government, and an increase is taking place in the extent to which the former crop is grown. The increased facilities that have been obtained for the manufacture of sugar are likely to cause a greater interest to be taken in this product.

The work of the Agricultural Instructor has included the holding of meetings in connexion with the cotton and lime industries. Through his efforts, a collection of exhibits was sent to the Canadian National Exhibition, 1909. The agricultural interests of the out-districts of Tortola and of the out-islands have been served directly by means of visits by this Officer.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with The Growth of Knowledge Concerning Soil Fertility. It presents the chief matters brought forward in the opening address given before the Agricultural Sub-section of the British Association.

An interesting and useful article on the manufacture and employment of concrete posts on estates is given on page 323.

Page 324 contains the statistics of cacao production during 1909.

An article on page 325 gives suggestions in relation to green manures that are suitable for employment on wet lands. The information contained in it should be of use in certain parts of the West Indies.

The Annual Reports on the Botanic Stations, etc., in St. Lucia and Tortola, are reviewed on page 327.

The Insect Notes, on page 330, give extracts from a paper that has appeared recently, which presents information concerning several insect pests in Jamaica. The extracts deal more especially with certain harmful insects attacking cacao in that colony.

The Fungus Notes contain the concluding part of the articles that have been appearing on Some Diseases of Rubber Trees. These articles, together, should form a useful summary of what is known up to the present concerning such diseases.

Trade of the Turks and Caicos Islands.

Colonial Reports—Annual, No. 646 is issued as a report on the Turks and Caicos Islands, for 1909, by the Commissioner, Mr. F. H. Watkins, I.S.O., lately Commissioner of Montserrat. It shows that the values of imports and exports during the year were £25,262 and £18,936, respectively. These are the lowest values on record since 1879. Although increased prices were obtained for the principal export—salt—the shipments fell from £19,439 to £15,732 in value, the reason for the short crop being the disastrous hurricane of 1908. The value of the sisal exported was lower for the same cause, being £608 as against £1,664 in the previous year. There was also a decrease in the values of the sponges and conchs exported; these were £953 and £510, respectively.

The Manuring of Rice.

The *Hawaiian Forester and Agriculturist* for July 1910 contains the continuation of a report on rice and cotton investigations in China and Japan. Attention is drawn, in this, to the fact that the paddy fields of Japan, even after centuries of heavy cropping, have increased in fertility every year, and that this increase has taken place to the greatest extent in their nitrogen content. This condition is contrasted with that existing on Hawaiian rice lands, which are continually becoming more impoverished, especially in the matter of nitrogen. It is suggested that the proper means for rectifying this is the adoption of the Japanese practice of using green manures, compost, and other organic manures, together with crop rotation with intertillage, according to the methods of the Japanese.

Experiments conducted by Japanese investigators have shown that the use of ammonium sulphate as a manure on rice soils results in an increase of yield, though it is uncertain as to whether this increase will continue to be maintained by the employment of that manure alone. It has certainly been shown, already, that an extensive use of this produces changes in the physical condition of the soil, which may be eventually deleterious

In consequence of the fact that sulphate of ammonia has continually shown itself to be more readily available for the rice plant than nitrate of soda, the suggestion has arisen that this plant is capable of assimilating its nitrogen directly in the form of ammonium sulphate. Investigations undertaken for the purpose of gaining certain knowledge on this point have shown that there are good grounds for the suggestion. Rice plants have been found to thrive where ammonium nitrogen was present but where there was complete absence of nitrate nitrogen. It appears to have been proved that ammonium nitrogen and organic nitrogen cannot change into nitrate nitrogen under the conditions of submerged cultivation. It has been shown, further, that under such conditions, very little nitrate nitrogen is actually available for plant nutrition, on account of the extent to which reversion takes place, and because of the loss by leaching. This matter of the direct use

of nitrogen in ammonium sulphate by the rice plant is of much interest in relation to recent work on the absorption of this substance by plants, by Hutchinson and Miller, of the Rothamsted Experiment Station. A general account of this work is contained in the *Agricultural News*, Vol. IX, p. 97, to which reference is made.

The Supply of Rubber to Japan.

It is pointed out, in *Diplomatic and Consular Reports*, No. 4511 Annual Series, that, as is the case in all other parts of the world, rubber has begun to attain greater importance in Japan. Up to the present, purchases have been small, but the fact that they have increased from 606,728 lb., valued at £59,800, in 1906, to 1,331,826 lb., valued at £150,000, in 1909, shows that the use of this product for manufacturing purposes in that country is becoming greater. The supplies are drawn from the Straits, Dutch Indies, London and America; they are required chiefly by the electric wire work companies, but a fairly large amount of rubber is consumed by rubber factories which chiefly make rubber tyres, rubber soles for 'tabi' (Japanese socks), and rubber balls. An increased use for tyres has been brought about owing to their adoption for jinrikisha in Tokio and Yokohama. Among the companies, there is a well known British one which manufactures cycle and other tyres; while there is another British company which makes rubber goods required in surgery.

In order to obtain a home supply, experimental plantations of rubber were made in Formosa a few years ago, and these tend to show that the prospects of rubber production in that island are good. Wild rubber exists there, but its collection is not feasible, on account of the fact that it grows in the savage districts, so that the operation is rendered difficult and expensive.

Some New Essential Oils.

The *Semi-annual Report* of Messrs. Schimmel & Co., issued last April, contains particulars of three new essential oils. The first of these is obtained from the leaves of *Cinnamonum Tamala*, which is a tree of medium size common in Southern Asia; it yields Mutterzimt, Cassia Lignea, or wood cassia. In former years, the leaves were met with in commerce as Folia Malabathri, but this is no longer the case, though they are still used medicinally in the East Indies. The essential oil obtained from them is lemon-yellow in colour, and possesses a clove-like, slightly peppery odour. The sp. gr. at 15°C. is 1·0257. The oil possesses a high eugenol content, and is thus allied closely to the ordinary oil from Ceylon cinnamon leaves.

Another oil has been obtained from the leaves of the guava (*Psidium Guava*), which, when chewed, are said to be a remedy for toothache. The oil is of a lemon-yellow colour, and has a faint aromatic odour. Its sp. gr. at 15° C. is 0·9157, and it is soluble in about 10 volumes of 90 per cent. alcohol.

A sample of oil was received from the Imperial Institute which had been prepared in Cyprus from *Mentha silvestris.* Its colour is yellow, and it possesses a faintly mint-like odour; the sp. gr. at 15° C. is 0·9701. It contains menthol, pulegone and phenol, so that it is prevented from being used either as peppermint oil, or as European pennyroyal, or origanum oil.

Cultivation and Uses of Cassava in Ceylon.

The *Progress Report* of the Ceylon Agricultural Society, dated August 1, 1910, gives an account of cassava cultivation in the Jaffna Peninsula. The area in this crop at present is about 1,000 acres, and the cultivation is extending. The roots that are obtained are used as food, in several ways: (1) they are peeled, sliced into pieces about 2½ inches long, boiled with salt and eaten by the coolies, either with or without cocoa-nut scrapings; (2) slices made in the way described are boiled in the water of the cocoa-nut and eaten by the middle classes in the place of rice and curry; (3) the roots are peeled and cut into small cubes, then put with the usual condiments and cocoa-nut milk to form curry. and the mixture is eaten, with rice, by all classes; (4) after the roots have been peeled, they are dried in the sun and converted into flour, which is used for the purpose of making different kinds of cakes and similar edibles. It is well known, also, that this flour is employed as an adulterant for wheat flour, by the bakers of Jaffna.

These uses for cassava in Ceylon suggest that the ways of employing the root as food in the West Indies may be extended.

The Arrowroot (New Markets) Ordinance, St. Vincent.

At a meeting of the Legislative Council, of St. Vincent, held on September 27, 1910, an Ordinance to be known as the Arrowroot (New Markets) Ordinance was introduced and passed.

The framing of the Ordinance has taken place under the auspices of the St. Vincent Arrowroot Growers' and Exporters' Association (see *Agricultural News*, Vol. IX, p. 285), and its purpose is to afford means for obtaining new markets for St. Vincent arrowroot by suitable schemes of advertisement. It provides for the imposition of an additional export tax of 6*d*. per barrel on arrowroot. This will be collected at the Treasury in the usual way, and will form a fund to be employed in paying for such means of advertisement as may be deemed fitting by the committee of management of the Association.

After the passing of the bill, a vote of thanks was tendered to His Honour the Administrator, to whom the St. Vincent Arrowroot Growers' and Exporters' Association recognized its indebtedness for the commencement of the work which has resulted in the present possession of the Ordinance.

INSECT NOTES.

SOME PESTS OF CACAO IN JAMAICA.

The following is extracted from an article by Professor R. Newstead, M.Sc., A.L.S., etc , which appears in the July number of the *Journal of the Royal Horticultural Society:*—

ANTS DESTROYING THE FLOWERS OF THE CACAO. So far as one could gather, the most destructive insect pest to the cacao in Jamaica is a small black 'fire ant', apparently a Myrmicid of the genus Solenopsis. It has been impossible so far to get this insect identified in this country, but it is in all probability known to the American entomologists. In its nest-building habits it resembles the terrestrial species of Formica and other allied genera found in the British Isles and in other parts of the world. The nests of the species in question were, however, generally constructed so that they were partly protected from the direct rays of the tropical sun, being sometimes completely overshadowed by the cacao trees. In the Chapelton district their nests were found scattered all over the plantations, and the ants were found foraging about the branches of a very large percentage of the cacao trees. The nests were often placed close to the trees on which the ants were found wandering about; but in several instances these structures were also found on the outskirts of the plantation, without apparently any regard to the distance the ants had to travel in order to reach their feeding grounds.

Many of the trees were found swarming with these insects, but it was some time before one could obtain any clue to the object of their search. Eventually it was discovered that they were attracted by the 'honey dew' secreted by small colonies of plant lice (Aphidae), which were feeding upon the leaves of the cacao, generally speaking, at some considerable distance from the main stem and branches. In order, apparently, to screen their movements, the ants constructed for themselves a narrow gallery or covered way, leading from the ground up to a point where the branches diverge from the main stem or trunk, or sometimes even to a greater elevation. The gallery was in all cases formed of pellets of earth, of a very fragile nature and easily removed. Having reached the main branches of the cacao under cover the insect sought further protection by forming larger covered ways among the dead flowers which had accumulated in the bifurcations of the branches and also among the clusters or 'cushions' of flowers upon the main branches. In the latter case the pedicels of the flowers had apparently been injured in such a way as to prevent them from falling from the tree, so that they remained in situ, shrivelled and dry, for indefinite periods, forming excellent retreats for the ants.

From these shelters, they seemed to be constantly moving to and fro among the upper branches of the cacao, seeking for the sweet juice secreted by the aphides. The dead flower-clusters were easily removed and, although carefully examined, did not appear to be cemented together by soil or other substances. At first, one suspected that the flowers had died from some unknown disease, but after careful investigation one came to the same conclusion as the planter, that they were destroyed by the ants. This was confirmed by the fact that the dead 'cushions' always occurred upon the lower portions of the main branches, and that they were invariably tenanted by these insects. The loss occasioned in this way was often considerable, and several methods of checking their ravages had been attempted with, unfortunately, but little success.

A mixture of lime, kerosene, turpentine, etc., had been tried as a preventive, but had proved a failure. Gas lime applied to the earth near the tree was effectual for a time, but on losing its offensive odour became useless. The system of grease-banding, in use in the country and elsewhere, was recommended for the pest, and as both tar and grease were available it was suggested that this might be used as a substitute for the proprietary article manufactured for such purposes. The result has not yet been communicated to me, and I am still in doubt as to whether such a compound will retain its viscosity for a sufficiently long period in the tropics, and thus act as a barrier to the inroads of the ants. This preparation should be applied to a strip of grease-proof paper to prevent direct contact with the bark of the tree.

LARVAE OF A WOOD-BORING BEETLE INJURING THE CACAO TREE. The larva of a longicorn beetle was tunneling the bark and wood of cacao trees in the Chapelton district. Its occurrence was extremely local, and so far as one could gather was fortunately, not of a serious nature. All the examples discovered had confined their attacks to the lower portions of the stem or main branches and always tenanted a spot which showed evident signs of either previous injury or decay. The subject requires further investigation, though it is doubtful whether the insect can, for the present at least, be looked upon as a serious pest.

As a means of prevention, tar should be applied to the ends of all freshly cut branches or other wounds produced by pruning or by other means, as a precautionary measure against the attacks of this insect.

GIRDLER-WEEVIL OF THE ORANGE AND CACAO (*Prepodes vittatus*). A pest of a much more serious nature than the larva of the longicorn beetle already referred to, is a brilliantly coloured weevil belonging to the Rynchophorus section of the Coleoptera. The larva of this handsome insect is a very serious pest to both the orange and cacao, and its methods of attack are very striking and distinctly characteristic. The grubs occur, invariably, just below the surface of the ground, and at a point usually immediately above the junction of the roots with the main stem of the tree; and they eat away every portion of the bark, right through the cambium layer, often completely girdling the stem. Every trace of the bark may be removed for a distance of 2 inches, so that a complete broad ring or girdle is formed, resulting in the ultimate death of the tree. Cacao trees thus attacked sometimes throw out adventitious roots just above the girdle, and in such cases the tree may survive for a time, but it rarely, I believe, recovers.

The complete life-cycle of this pest has not yet been fully traced out, but Mr. E. J. Wortley has been successful in rearing the beetles from larvae taken from the roots of orange trees. The grub or larva is footless, and whitish in colour, measuring approximately 1 inch in length when fully matured. The adults are very handsome insects and are closely related to the so-called 'diamond beetles'.

At the present moment, one can say very little regarding the geographical distribution of this pest outside the island of Jamaica. There is, so far as one can find, no record of its occurrence as a pest in the Lesser Antilles, though several allied snout-beetles occur in Barbados—the weevil-borers of the sugar-cane (*Sphenophorus sericeus* and *Diaprepes abbreviatus*) and the grain or granary weevil (*Calandra oryzae*). In Dominica and Montserrat is the destructive palm weevil (*Rhyncophorus palmarum*); and in Trinidad the banana is attacked by *Spenophorus sordidus*.

As to the distribution of the girdler-beetle in Jamaica one has very little information to rely upon, but it evidently

occurs in widely separated portions of the island, so that in all probability it is generally distributed. But it is satisfactory to note that it was not observed in many of the large cacao plantations and in two extensive orange groves which I inspected during the months of December and January (1908-9).

The most effective measure for the prevention of the attacks of the insect is removal of the surface soil from the base of the tree trunks, replacing it with loose rock chippings, or small stones. Unfortunately, the injury is often done before the planter is aware of the presence of the pest. Plantations of cacao or orange groves found harbouring the grubs should, therefore, be carefully examined, and if the infestation is found to be extensive, it may be necessary to treat all the healthy trees in the way that has been indicated. Carbon bisulphide, if obtainable in large quantities and at a cheap rate, would doubtless prove effective in destroying the grubs.

A layer of gas lime spread round the stem of the trees might well act as a preventive against the beetles laying their eggs at the foot of the plants. But even if it were proved experimentally to be an efficient measure of prevention, it would be quite impossible to adopt this method in places which are situated at great distances from the railway.

THE OIL SEED CRUSHING INDUSTRY OF MARSEILLES, 1909.

The imports during 1909 have been the largest on record for the previous ten years, viz., 596,156 tons, against 465,049 tons in 1908, and 501,811 tons in 1907. This increase is chiefly in ground nuts from the Coromandel Coast, from China and from Africa. Imports of gingelly seed have also been large—64,087 tons against 41,749 tons in the previous year.

The bulk (about seven-eighths) of these imports has been crushed by local oil mills, and this industry has proved exceptionally prosperous to crushers, as by reason of the short output of cotton seed oils in America and the enormous deficit in the supply of olive oils, chiefly in Spain and Italy, there was constant demand for Marseilles edible oils, and local crushers met with a ready and remunerative sale of all their production.

The cost price of West African ground nuts in shell ranged from 22 fr. 50c. to 31 fr. per 100 kilos., and for Bombay white gingelly or sesame seed from 32 fr. 50c. to 40 fr. per 100 kilos. delivered on the quay at Marseilles. (West African ground nuts and Bombay sesame seed are the two leading staples crushed for edible oils.)

In addition to the above-mentioned edible oils, there is to be noticed the largely increased demand for, and production of, cocoa-nut oil, used for making butter substitutes. Several well-known and reputed brands of this article are largely made in Marseilles.

Owing to the high value of lard in the United States, and of kindred butter-oils, local crushers have had difficulty in satisfying the increased demand for these oils, which have sold at record prices, and this branch has been a most profitable trade. Large quantities have been exported to the United Kingdom and to other countries in North Europe. The increased consumption and remunerative prices paid for these oils have offered inducement for the erection of several large mills in Hamburg, Lubeck, and also in the United States.

By reason of this large consumption of oils for edible purposes, it has become difficult to produce a sufficient supply of the lower grades of copra oils for the soap mills, and the result has been a constant rise in the value of copra. Manila copra rose from 43 fr. 50c. in January to 56 fr. in December per 100 kilos., c.i.f. Marseilles.

The value of soap oil having risen proportionately, the soap makers have been placed at a great disadvantage by the high cost of their raw material, and the soap trade has been much less profitable than in previous years.

A very notable feature of interest in the oil seed and crushing industry during the past year has been the enormous export from Manchuria of soya oil beans, an article which is entirely new in Europe, and of which 380,000 tons were exported during the year, mostly to the United Kingdom. Owing to the customs duty of 2 fr. 50c. per 100 kilos. on these beans imported into France, there is no trade here in this commodity. Further, these beans containing only about 12 per cent. of oil, are chiefly crushed for the cake, which is used as a cattle food, and for this business the northern ports are better placed than Marseilles. (*Diplomatic and Consular Reports*, No. 4516 Annual Series.)

BANANA MEAL.

An article in *L'Agronomie Tropicale* for May 1910 draws attention to the fact that banana meal, made from the fruits while they are still green, has attracted an increasing amount of interest during recent years. Moreover, the price of the fruit itself has become so low, that it is now available for the use of the general public. Numerous analyses show that a ripe banana contains 40·08 per cent. of sucrose, and 27·62 per cent. of glucose. The nutritive value of the banana is very high; it gives, in energy units, 1 calorie per gram; while, after drying, it furnishes as much as 2·85 calories. Much attention has been given recently to the preparation of the meal. In this, the unripe fruits are ground up, after a preliminary drying.

The chemical composition of the meal is very different from that of the ripe fruits. While peeled bananas only contain 1 to 2 per cent. of starch, with 70 per cent. of sugar, the meal made from the green fruit shows the reverse proportion in these figures, namely, 80 per cent. of starch, with 3 to 4 per cent. of sugar. This shows plainly that, during the ripening of the banana, there is a large transformation of starch into sugar.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from Grenada, on October 4, by the R.M.S. 'Balantia'. Dr. Watts left Barbados, by the R.M.S. 'Berbice' on October 10, for British Guiana, for the purpose of conferring with His Excellency the Governor with regard to the preliminary arrangements for holding the forthcoming Agricultural Conference in that colony.

Mr. W. N. Sands, Agricultural Superintendent of St. Vincent, who recently visited Canada, on behalf of the Imperial Department of Agriculture, for the purpose of assisting in advancing the interests of the West Indies at the Canadian Exhibitions at Toronto and St. John, returned to St. Vincent on the 8th instant.

GLEANINGS.

The Agricultural and Commercial Society of St. Kitts is making arrangements for the holding of an agricultural show next year. The date on which this will take place will be probably February 24.

According to a report received from Antigua, sugar-cane in the island made fairly good growth during September, compared with that of previous months. The condition of the cotton crop, so far, is stated to be very fair.

In connexion with the interest that is being evinced at the present time in relation to agricultural banks, it may be noted that a leading article on the subject, with special reference to the West Indies, appears in the August issue of *Tropical Life.*

Returns that have been received showing the areas of cotton being grown at the present time on different estates in Antigua are interesting, as they indicate that an increase is taking place in the extent to which this crop is planted there, and that its cultivation is becoming more wide-spread. The total area under cotton in Antigua during the present season is 424 acres.

A report from the Agricultural Superintendent, St. Kitts, shows that the cane crop in the island is growing well, but that it is backward for the time of the year. The growth of cotton in the island is satisfactory, on the whole; it has been affected in a few places by heavy rain. In a general way, the rains of last month have caused considerable growth to be made by all crops.

The report of the Agricultural Instructor, St. Vincent, for August 1910, shows that most of the crops cultivated on the Land Settlement estates, and on the private estates visited, were in good condition. This was especially the case with cotton. It is stated, however, that there is still room for improvement on all estates in regard to the use of green dressings and pen manure.

A report by H.M. Consul at Para shows that the exports of rubber from Para, Manaos, Iquitos and Itacoatiara during the crop year 1909-10, which ends on June 30, were as follows: to Europe 21,882,032 kilos.; to the United States 17,071,443 kilos. This makes a total for the year of 38,953,475 kilos.; the corresponding export for 1908-9 was 38,234,871 kilos.

Nature, for August 25, 1910, states that the International Horticultural Exhibition of 1912 will be held in the grounds attached to the Royal Hospital, Chelsea. The area leased for the purposes of the exhibition is about 20 acres, and nearly three-quarters of this will be directly available for the accommodation of the exhibits. The remaining portion contains many fine specimens of trees.

Recent issues of the *Port-of-Spain Gazette* contain an advertisement by the Department of Agriculture of Trinidad for an Agricultural Instructor for Tobago. This states that the appointment will be temporary, and that candidates are required to supply particulars of the posts previously occupied by them, and of their training. An essential qualification for the position is the possession of experience in the working of a cacao estate.

The *Report on the Introduction of Improvements into Indian Agriculture*, extracts of which were given in the *Agricultural News*, Vol. IX, p. 293, was referred to a Committee of the Board of Agriculture in India, 1910. The report of this committee, as submitted to and passed by the Board, has been recently published for general information, under the title of *Second Report on the Introduction of Improvements into Indian Agriculture.* This publication shows what progress has been made under the various heads detailed in the first report.

The *Commonwealth Gazette* of July 1910 contains copies of two Proclamations dated June 28, 1910, issued by the Governor-General of the Commonwealth of Australia, under the Quarantine Act of 1908. These provide for the appointment of Hawkesbury Farm, in the State of New South Wales, as a quarantine ground for growing plants imported into New South Wales, and for the appointment of a specified area near the township of Palmerston, Port Darwin, as a quarantine station for plants imported into the northern territories of the States of South Australia. (The *Board of Trade Journal*, August 25, 1910.)

The *Experiment Station Record*, Vol. XXII, p. 703, contains extracts from a paper on the stimulation of premature ripening of fruits by chemical means, which appeared in the *Journal of the American Chemical Society*, Vol. XXXII, p. 208. In this, the conclusion was reached that the apparent stimulation of the ripening of fruits by chemical means depends solely on the killing of the protoplasm. Substances introduced into the fruit kill or stimulate the protoplasm, release the previously insoluble intracellular enzymes without rendering them inactive, and thus bring about ripening, if the fruits have reached the necessary degree of maturity.

The Annual Report on the Dominica Botanic Station, for 1909-10, which is in the press, contains the following suggestion concerning the Courses of Reading of the Department. It is advised that, under the conditions obtaining in Dominica, candidates in that island should answer the questions which appear in the Students' Corner of the *Agricultural News*, and forward them to the Botanic Station, where they would be corrected, and from which model answers would be issued, if this is necessary. At the same time, assistance would be given to candidates, in solving any difficulties that may have occurred in connexion with their reading.

STUDENTS' CORNER.

OCTOBER.

Second Period.

Seasonal Notes.

Notes have been given already in the Students' Corner, from time to time, on the preparation of the soil for the coming sugar-cane crop. This work is now receiving special attention, and in some places it will present an opportunity to compare the effects of the different tillage implements on the soil, especially those of the mould-board plough as contrasted with those of the cultivators. What is the eventual difference between the results required from ploughing and those for which cultivation is employed? What are the possible kinds of harm from ploughing the heavier soils too deeply? Those whose knowledge of the subject has reached the proper stage may well discuss the conditions that are bringing about the extended employment of implemental tillage in some parts of the West Indies.

Careful observations, having for their object the ascertaining of the extent to which the root disease of sugar-cane is prevalent, should be made, both on plants and ratoons. Can you suggest any reason for the fact that, although the fungus naturally grows best during wet weather, yet its effects are most readily seen at times when the rainfall is insufficient? The consideration of disease serves as a reminder of the care that is required in the selection and preparation of material for planting. This is preferably raised specially in a nursery, in which varieties are produced that show a special power to resist disease. In any case, cuttings should be treated with Bordeaux mixture. Those who have not witnessed the making of this useful fungicide should do so, on the first opportunity. For the purpose of showing the efficiency of this, one or two rows of cane might be planted with untreated material, when the time for sowing arrives, so that the germination in these may be compared with that in the rows of treated cuttings. The reports issued by the Imperial Department of Agriculture should be consulted for the purpose of ascertaining, in any given district, what are the best varieties of cane to plant.

The sugar-cane will have commenced to arrow. Seed and seedlings are obtained from the arrows, in the following way. Part of the arrow, before the flowers on it open, is enclosed in a paper bag, in which it is kept until there has been time for fruits to form. The arrow and the contents of the bag are then put on fine earth, contained in boxes or pots, and covered with a thin layer of soil. This earth should have been treated previously over a coal or wood fire for the purpose of destroying any seeds of weeds, and insects and fungi, that it may contain. The boxes or pots should be watered carefully; they are generally kept in the shade, in the West Indies—a procedure that, it is interesting to note, is very different from that followed in Java. In the latter country, the seeds (fruits) are sown in boxes, in a heavy, fertile soil; the boxes are placed in the sun, and the soil is kept wet. Cane seedlings are usually planted out when they are about a foot high.

Cotton will have now reached a stage, where it was sown early, at which indications may be obtainted as to whether it was planted at proper distances, or not. It is evident that, on the heavier soils, the spread of the roots will be smaller than in the lighter ones, so that it may be planted more closely together, on the former. Similar considerations, in relation to the fertility of the soil, will show that there is much less likelihood of interference taking place among the roots in poor soil than when the plants are growing in one which is rich. What bearing has the effect of light soils on the growth of the roots of this plant, in relation to the comparative maintenance of the apparent fertility of cotton soils? (See *West Indian Bulletin*, Vol. XI, p. 68.)

The flowers of cotton form fruits, even if they are enclosed in a paper bag before they open. What does this show? Describe the way in which you would cross-pollinate the flowers of different cotton plants. For what purpose is such pollination employed? Cut open several cotton bolls of different ages, and study the development of the lint and the seeds. How does cotton lint obtain its natural twist? Make observations on the growing bolls for the purpose of finding out to what extent diseases of these are present; at the same time, find out the degree to which the leaves are being attacked, and see if it is possible to trace any connexion between the two cases. When the time comes for the selection of plants in the field, great care must be exercised to ensure that due attention is given to the extent to which these show the power to resist disease. It is of much importance that this character is given its proper place in any scheme of selection.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What elements are lost when vegetable matter is burned, and which are left behind?

(2) Why is it that a strong, dry wind will often cause the 'scorching' of the leaves of young plants?

(3) What are the special uses of nitrogen, potassium and phosphorus, respectively, in relation to the life of the plant?

INTERMEDIATE QUESTIONS.

(1) How may insects be classified, in relation to the ways in which they feed, and how does such a classification give indications as to the methods to be used for their control?

(2) What breeds of cattle are chiefly used in the West Indies for work, for providing milk, and for general purposes?

(3) Give an account of the employment of temporary wind-breaks in cotton fields, naming the plants that are most suitable for forming these.

FINAL QUESTIONS.

(1) Discuss the employment, for planting, of grafted cacao, in the place of cacao raised from seed. What advantages and disadvantages attend the adoption of either course?

(2) Can horses be raised profitably in the district in which you live? If so, how should the business of raising them be conducted?

(3) Of what use, to the agriculturist, is the existence of different varieties of the same plant?

The *Journal d'Agriculture Tropicale*, No. 108, p. 188, states that the *Bulletin de la Société des Agriculteurs Italiens*, for August 15, 1909, makes a note of the possibility of utilizing the prickly pear for the purpose of destroying mosquito larvae. The method of use is to throw the fleshy stalks into the water containing the larvae, where they disintegrate, forming a kind of mucilage, which rises to the surface. The effect of this mucilage is said to be similar to that of kerosene, when it is used for the same purpose: it prevents the larvae from reaching the air, and they are destroyed in fifteen to fifty hours. The mucilage is also stated to prevent the mosquito from laying eggs on the water, or at any rate, to stop the development of these.

FUNGUS NOTES.

SOME DISEASES OF RUBBER TREES.
PART III.

STEM DISEASES (continued). In the *Bulletin of the Straits and Federated Malay States*, Vol. IX, p. 216, a short account is given of a fungus which was observed on the trunks of some dead trees of Hevea. It appeared in the form of black and rather brittle crusts, each measuring $\frac{1}{16}$- to $\frac{3}{8}$-inch in thickness. These burst through the bark some time after the trees were dead, causing the outer corky layers to split off in flakes. Specimens were forwarded to Kew for identification, and in reporting on them, Massee says: 'The fungus proves to be an undescribed species of *Eutypa*, and will be called *E. caulivora*. It is probably a true parasite, judging from what is known respecting other species of *Eutypa*, a constant feature of which is that the fungus persistently remains in a vegetative—and thus aggressive—condition, so long as its host remains alive, and only comes to the surface to produce fruit when the host is absolutely dead. The numerous black streaks, deep in the wood of the specimen sent, are produced by the mycelium of the fungus, which in all probability permeated the whole of the wood, and had been at work for a considerable period of time. Such a development of mycelium is unknown as a post-mortem result.'

It is difficult to see what remedial measures can be recommended, as the fungus gives no indication of its presence until the tree is dead. Its spread could probably be arrested by carefully destroying all trees that have died from its effects. This disease has been dealt with at some length on account of the fact that another species of the same genus of fungi, *Eutypa erumpens*, Massee, has been found of late years on several different host plants in the West Indies; among these may be mentioned cacao, nutmeg, Barbados evergreen (*Ficus* sp.), and several forest trees. It occurs in Trinidad, Barbados and Grenada. It is thought to be a wound parasite, and produces symptoms very similar to those caused by *E. caulivora*. (See also *Kew Bulletin*, 1910, p. 251.)

In Bulletin 6 of the Department of Agriculture of the Federated Malay States, Gallagher described a stem and branch disease affecting Hevea trees in that country. This attacks trees varying from three to eight years of age, and spreads fairly rapidly. On young plants it seldom proves fatal, but in the case of older ones, it frequently necessitates their destruction. The trouble is not so far very wide-spread, although it appeared simultaneously in several different localities. *Corticium Zimmermannii* (= *Corticium javanicum*), has been found associated with the disease, but has not been proved to be the cause. The attack usually commences above the fork, on the stem or lateral branches. The first sign is the presence of tears of coagulated latex on the part affected. The upper surface of a diseased branch appears black and cracked, and has blotches of latex where the fungus commenced its attack. The branch is soon ringed, and consequently dies, the leaves at the same time dropping. Diseased branches and portions of stem should be removed carefully, and the wound so made, tarred. Young trees in the neighbourhood of those attacked, should be sprayed with Bordeaux mixture.

In some instances in Ceylon, in 1905, it was found that the horse-hair blight spread from tea plants to Hevea trees planted among them. The fungus is probably a species of Marasmius. (See *Agricultural News*, Vol. IX, p. 206.)

A canker disease of *Funtumia elastica*, occurring in Uganda, is described by Massee in the *Kew Bulletin*, 1909, No. 3, p. 147. The trunk is attacked at a height of 4 to 6 feet above the ground, where a small black patch appears in the bark, which extends until it covers an area of as much as a foot or more. Later, the bark becomes thick, cracked and rugged; if the fungus spreads completely round the trunk, as may happen, the tree is killed. The disease is due to a new species of Nectria, *N. funtumiae*, Massee., and is similar to the canker of Hevea in Ceylon which was described above. Massee considers that the same remedial measures as are made use of in Ceylon would probably prove effective in its control. (*Agricultural News*, Vol. VIII, p. 185.)

FRUIT DISEASES. A blackening and decay of Hevea fruits was reported by Petch in Ceylon, in 1905 (*Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. III, p. 281). The disease was due to a species of Phytophthora similar to that found on cacao pods in the West Indies and other parts of the world. The same fungus was also found on cacao and bread fruit in Ceylon, and recorded by Petch in the *Administration Reports*, 1906. In view of Rorer's recent work in Trinidad, the possibility is suggested that the canker of Hevea may be also primarily due to the same species of Phytophthora. On the rotten fruits, *Nectria diversispora*, *Sphaeronaema album*, Petch, and *Diplodia zebrina*, Petch, were found. These, in all probability, bear the same relation to the disease of Hevea fruits as the various species of Nectria do to the black rot of cacao pods, that is, they are saprophytes. In 1906 the disease had disappeared, mainly owing to the weather conditions. Careful destruction of diseased fruits is recommended as a preventive measure.

SEEDLING DISEASES. Two important seedling diseases of Hevea are known, one occurring in Ceylon, and apparently imported from that island into Borneo; the other, in the Malay Peninsula. The first is due to the grey blight fungus, *Pestalozzia Guepini*, Desm., which also attacks tea. It occurs on the stems of seedlings at the collar, where it forms a white ring round the stem, bordered by a narrow red-brown line. The disease may also occur on the leaves of seedlings, when it does but little harm, whereas when attacking the stem it kills the plant. (*Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. III, p. 280; *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. V, p. 400.)

The seedling disease in Malay is due to a fungus which attacks the leaves of young nursery plants and may cause very serious damage. The leaves are deformed, being narrow and inequilateral, with the nerves irregular, wavy, and ascending towards the tip. Pale, whitish-orange patches of dead tissue are scattered over the leaf. These are $\frac{1}{8}$- to $\frac{1}{4}$-inch across, of irregular shape, and have a raised edge. Minute black dots occur on the upper surface of these patches which, according to Massee, are the fructifications of a species of Cercospora, though it was at first suggested that the fungus was a member of the Uredineae. Bordeaux mixture and the careful removal of diseased leaves would probably be found effective in dealing with this trouble. (*Agricultural Bulletin of the Straits and Federated Malay States*, Vols. III, p. 308; and IV, pp. 68 and 271.)

LEAF DISEASES. These diseases are of very little importance. *Helminthosporium heveae*, Petch, occurs on the leaves of

seedlings in Ceylon, and forms small, circular semi-transparent spots, bordered by a purple-brown line. *Colletotrichum heveae*, Petch, and *Gloeosporium brunneum*, Petch, cause the yellowing and dropping of the first two leaves of seedlings in Ceylon. *Phyllosticta heveae*, Zimm., and *Gloeosporium elasticae*, Cke. and Mass., also occur in Ceylon and Java. In the Amazon district, where the tree is native, *Phyllachora Huberi*, P. Henn., *Dothidella Ulei*, P. Henn., *Aposphaeria Ulei*, P. Henn., *Ophiobolus heveae*, P. Henn., and *Parodiella melioloides* (Berk. and C.) Wint., occur on Hevea; all are unimportant, with the possible exception of the Ophiobolus. Bernard records *Pestalozzia palmarum* from the Dutch East Indies. *Colletotrichum ficus* and *Colletotrichum elasticae* occur on the leaves of *Ficus elastica* in Java, the former producing lines of raised dots; the latter, small black-tufted spots.

The following references to literature dealing with these may be given: Petch, *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. III, p. 280; *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. III, p. 173; P. Hennings, *Notizblatt des Königl. Botanischen Gartens und Museums zu Berlin*, Vol. IV, p. 133; Bernard, Bulletin XII, du Département de l'Agriculture aux Indes Néerlandaises; Koorders and Zehnter, Bulletin No. 3 of the Algemeen Proefstation of Salatiga, quoted in the *Agricultural Journal of the Straits and Federated Malay States*, Vol. V, p. 8.

Further information on the whole subject will be found in the *Agricultural News*, Vols. V, p. 362, and VI, p. 318, in addition to that given in the references already quoted.

This concludes the account of the principal diseases of rubber trees, as far as the literature obtainable at the Head Office of the Department will permit. It is noticeable that very few of them have made their appearance, as yet, in the West Indies, although cacao is extensively cultivated in most of the islands into which rubber cultivation has been introduced; the cacao diseases, which are for the most part very similar to those found in the East, do not appear to have spread to rubber in the West Indies, as they seem to have done in Ceylon and elsewhere. A possible exception to this statement is the fact that a fungus almost exactly similar to, if not identical with, *Lasiodiplodia theobroma*, Griffon and Maublanc, has been found on Castilloa in Trinidad. It is to be hoped that, if reasonable precautions are taken, this immunity from disease will be found to continue.

THE DIRECT PRODUCTION OF AMMONIA.

The London *Times Supplement* for May 18, 1910, contained the following information concerning the manufacture of ammonia from its elements—nitrogen and hydrogen. It is of interest, in that it indicates a new way of combining nitrogen for use in manures:—

In view of the rapid increase in the demand for fixed nitrogen, and the steady diminution of the Chile saltpetre deposits, the manufacture of ammonia from its elements, nitrogen and hydrogen, would be of enormous industrial importance, and would be the more advantageous economically, inasmuch as nitrogen and hydrogen can be obtained at a cost which only amounts to a fraction of the market price of ammonia.

The synthetical production of ammonia has, so far, been considered impossible from a technical point of view, the inertness of nitrogen at low temperatures, and the slight affinity between that element and hydrogen at high temperatures, seeming to exclude any possibility of practical success. Dr. F. Haber, Professor at the Carlsruhe Technical High School, has shown, however, in a series of experiments carried out with the assistance of M. R. Le Rossignol, that the direct combination of the two elements can be realized in such a way as to lend itself to commercial utilization, by the aid of enormous pressures, far exceeding any so far applied for technical purposes in connexion with gas reactions. It is true that, even at a pressure of 200 atmospheres, the combination of the elements is always incomplete, but the ammonia, as it is formed, can be removed by the use of a high-pressure circulating system, comprising, in a closed cycle, a reaction vessel, precipitation vessel, and circulating pump. After being liquefied by moderate cooling in the precipitation vessel, the ammonia can be drawn off, the unused amounts of nitrogen and hydrogen remaining in the cycle. An apparatus for laboratory purposes, exhibited by Professor Haber at a recent lecture, can be continuously worked at a pressure of 185 atmospheres, producing 90 grams of liquid ammonia an hour.

Extensive experiments on the efficiency of various catalysing agents at pressures close to 200 atmospheres have shown osmium to be an excellent substance for the purpose. With a mixture of about three volumes of hydrogen, to one of nitrogen, at a pressure of 175 atmospheres and a temperature close to 550° C., an output of upwards of 8 per cent. of ammonia by volume was readily obtained, by the aid of finely divided osmium. The supply of this element, however, is small, and accordingly some more abundant catalyst was sought for. Uranium, which according to the periodic system, bears a similar relation to the slightly active chromium as osmium does to iron (which has long been known to exert a certain catalytic action), was found to be very suitable.

The results attained seem to prove the commercial possibilities of the process, and as it is being developed by the Badische Anilin and Soda Fabrik at Ludwigshafen, the synthesis of ammonia from its elements at high pressure may be safely counted among the means on which agriculture can depend for the supply of nitrogen products.

BRITISH WEST INDIAN TRADE WITH VENEZUELA, 1908.

From information received at His Majesty's Legation at Caracas from the various British West Indian colonies relative to the trade between them and Venezuela, the following figures have been taken for the year 1908:—

	Imports from Venezuela. £	Exports to Venezuela. £
Barbados	61	2,366
British Guiana (1908-9)	420	71
Windward Islands	378	315
Trinidad (1907-8)	424,322*	52,279*

The exports from Venezuela to Demerara consisted of cattle, and to Trinidad and Grenada, of cacao, balata gum, cattle and hides. (*Diplomatic and Consular Reports*, No. 4515 Annual Series.)

* Exclusive of transhipment trade.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR September 27, 1910; Messrs. E. A. DE PASS & Co., September 16, 1910.

ARROWROOT—St. Vincent, $1\frac{7}{8}d.$ to $1\frac{5}{16}d.$
BALATA—Sheet, 3/3; block, 2/3 per lb.
BEESWAX—£7 10*s*
CACAO—Trinidad, 53/- to 63/- per cwt.; Grenada, 49/6 to 55/-; Jamaica, 48/6 to 52/6.
COFFEE—Jamaica, 42/- to 92/-.
COPRA—West Indian, £28 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 58/- to 65/-.
HONEY—24/- to 25/-
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/2; concentrated, £18 2*s.* 6*d.* to £18 15*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{8}d.$; fair, $2\frac{1}{4}d.$; good, $2\frac{3}{8}d.$ per lb.
RUBBER—Para, fine hard, 7/-, fine soft, 6/9; fine Peru, 6/11 per lb.
RUM—Jamaica, 1/7 to 4/6.
SUGAR—Crystals, 15/9 to 19/-; Muscovado, 12/- to 14/6; Syrup, 10/6 to 13/-; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., September 16, 1910.

CACAO—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, 11c. to $11\frac{1}{4}$c.; Trinidad, $11\frac{1}{2}$c. to $11\frac{3}{4}$c.; Jamaica, 9c. to 10c. per lb.
COCOA-NUTS—Jamaica, select, \$34·00 to \$35·00; culls, \$19·00 to \$20·00; Trinidad, select, \$34·00 to \$35·00; culls, \$19·00 to \$20·00 per M.
COFFEE—Jamaica, ordinary, $10\frac{3}{4}$c.; good ordinary, 11c.; and washed, up to $12\frac{1}{2}$c. per lb.
GINGER—$8\frac{3}{4}$c. to 12c. per lb.
GOAT SKINS—Jamaica, 56c.; Barbados, 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 52c., dry flint.
GRAPE FRUIT—\$3·50 to \$5·00 per box.
LIMES—\$5·50 to \$6·50.
MACE—35c. to 40c. per lb.
NUTMEGS—110's, 9c. to $9\frac{1}{4}$c. per lb.
ORANGES—Jamaica, \$2·00 to \$2·50 per box.
PIMENTO—$4\frac{3}{16}$c. per lb.
SUGAR—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid

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Trinidad.—Messrs. GORDON, GRANT & Co., October 1, 1910.

CACAO—Venezuelan, \$11·75 per fanega; Trinidad, \$11·50 to \$11·75.
COCOA-NUT OIL—\$1·10 per Imperial gallon
COFFEE—Venezuelan, $10\frac{3}{4}$c. per lb.
COPRA—\$5·20 per 100 lb.
DHAL—\$4·00.
ONIONS—\$3·25 per 100 lb.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$1·70 to \$1·80 per 100 lb.
RICE—Yellow, \$4·70 to \$4·75; White, \$4·95 to \$5·00 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., October 8, 1910; Messrs. T. S. GARRAWAY & Co., October 10, 1910; Messrs. JAMES A. LYNCH & Co., October 3, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$10·50 to \$12·00 per 100 lb.
COCOA-NUTS—\$21·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$12·50 per 100 lb., scarce.
HAY—\$1·20 to \$1·40 per 100 lb., dull.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·50 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·30 per bag of 210 lb.; Canada, \$3·45 to \$3·65 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·00 to \$3·00 per 160 lb.
RICE—Ballam, \$4·80 to \$5·00; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, October 1, 1910; Messrs. SANDBACH, PARKER & Co., September 30, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·00 to \$8·25 per 200 lb., wanted	Wanted
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	$14\frac{1}{2}$c. per lb.	$14\frac{1}{2}$c. to 15c. per lb.
Liberian	$8\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$3·65 to \$3·70 per bag of 168 lb.	\$3·70 per bag of 168 lb.
Green Dhal	\$4·60	——
EDDOS—	\$1·08	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	$2\frac{1}{4}$c. to $2\frac{1}{2}$c.	$2\frac{1}{2}$c.
PEAS—Split	\$6·00 per bag (210 lb.)	\$5·75 to \$6·00 per bag (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	24c. to 40c.	
POTATOS—Nova Scotia	\$2·75	\$2·75
Lisbon	——	No quotation
POTATOS-Sweet, Barbados	\$1·20 per bag	——
RICE—Ballam	\$4·80 to \$4·90 per 175 lb.	\$4·80 to \$4·90
Creole	\$5·00 to \$5·10	\$5·00
TANNIAS—	\$2·28 per bag	——
YAMS—White	\$3·24	——
Buck	\$3·50	——
SUGAR—Dark crystals	\$2·65 to \$2·70	None
Yellow	\$3·00 to \$3·10	\$3·70
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·25 to \$2·60	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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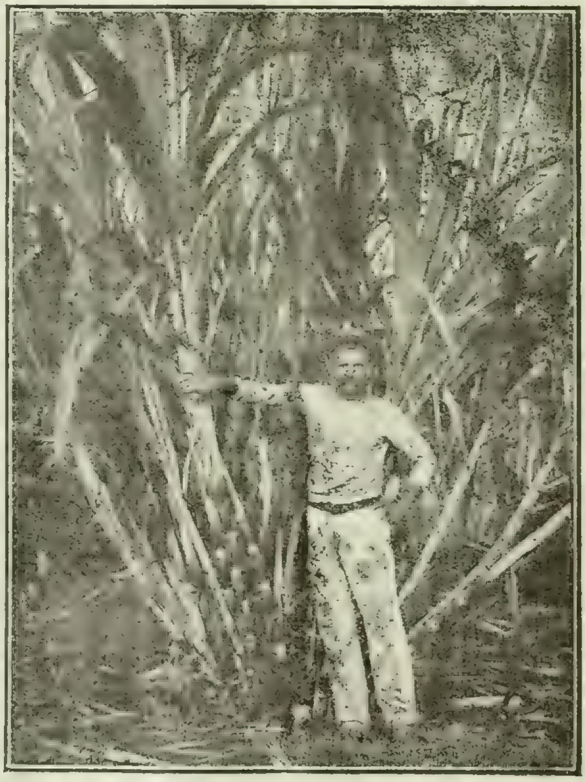

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Agricultural Conference, 1911.

THE number of agricultural conferences that have been held, so far, in the West Indies, taking into account the one which was interrupted, in Jamaica in 1907, is seven. The first took place in 1899, and they were held annually, until 1903 and 1904, when quarantine difficulties at Barbados and Trinidad, respectively, led to their suspension. They were resumed in 1905, but a proposed meeting of the kind in Jamaica was rendered impossible, in the next year, owing to transport difficulties. In 1907, these difficulties were surmounted, and the delegates travelled to that colony, where however, as has been indicated, the occurrence of the earthquake made it impossible to hold more than part of the first meeting. Barbados was chosen as the place of meeting, in 1908, and since this occasion, no agricultural conference has been held in the West Indies.

Arrangements are now in progress for holding the next West Indian Agricultural Conference from January 11 to 18, 1911, at Georgetown, British Guiana. In anticipation of a visit by the Imperial Commissioner of Agriculture to British Guiana in connexion with the preliminary arrangements for the Conference, a Committee was appointed by His Excellency the Governor of British Guiana, for the purpose of assisting in making these: from this Committee, a sub-committee was delegated with the object of obtaining suggestions in relation to the matter. The visit of the Commissioner was made on October 12, when he arrived in the colony as the guest of the Governor. Dr. Watts was afforded an opportunity of conferring with the Committee, as well as with others who are more directly interested in matters appertaining to the Conference, when it was found that the sub-committee had a very complete list of suggestions to place before the Committee. The meeting at which these were brought forward was held on October 14, at the office of Professor J. B. Harrison, the Director of Science and Agriculture, British Guiana.

As a result of the deliberations of the committee, in consultation with the Imperial Commissioner of Agriculture, a provisional programme has been outlined, as follows, and submitted by the Commissioner to the

Governor of British Guiana:—

Wednesday, January 11. The members of the Conference, from other colonies, arrive at Georgetown by Royal Mail steamer. The Conference is opened in the Town Hall by His Excellency the Governor. The Conference remains in session until the afternoon.

Thursday, January 12. Session of the Conference during the morning and afternoon.

Friday, January 13. Session of the Conference during the morning and afternoon.

Saturday and Sunday, January 14 and 15. Excursion to Bartica, Agatash, the Penal Settlement, Onderneeming, Suddie, etc., returning to Georgetown on the night of the 15th.

Monday, January 16. Session of the Conference during the morning and afternoon.

Tuesday, January 17. Excursion to Berbice; meeting to be held at New Amsterdam.

Wednesday, January 18. Visit to Plantation Diamond in the morning. Closing session of the Conference in the afternoon. Those delegates from the other colonies who may wish to do so may leave, by Pickford & Black steamer, in the evening. In this connexion, it may be mentioned that Messrs. Pickford & Black will be approached with a view to their making arrangements for this steamer to call at Grenada and St. Vincent, for the convenience of the delegates from those colonies.

The proposal has been made, on behalf of the Royal Agricultural and Commercial Society, to hold a Conversazione and President's Reception, on one evening among the dates given above, to which the members of the Conference will be invited. It is hoped that arrangements will be made for two lectures, illustrated by lantern pictures, to be given on rubber-growing. If this plan is found to be feasible, one of the lectures will be on rubber-growing in the Eastern Hemisphere, by Dr. Cramer, and the other on rubber-growing on the Western Continent, by Mr. F. A. Stockdale, B.A., F.L.S., Assistant Director of Agriculture, British Guiana. Other collateral meetings, at which treatment of subjects of interest to the delegates will be given, are doubtless to be arranged.

At the meeting of the Committee described above, Professor Harrison announced that free passes over their lines would be issued to the delegates by the Demerara Railway Company, and that similar passes will be given to the delegates by Messrs. Sprostons, Ltd., for use on their steamers. He stated, besides this, that the Demerara Electric Company had offered to place two cars at the disposal of the Committee, on any afternoon during the sittings of the Conference, in order to afford opportunities of viewing Georgetown and its precincts. There is no doubt that delegates will give full appreciation to offers of such an acceptable and helpful nature.

After the business of the meeting had been completed, the Imperial Commissioner of Agriculture thanked the Committee and sub-committee for the very thorough and excellent manner in which the preliminary arrangements for the Conference had been made by them, and expressed appreciation of the generous assistance that had been proffered by the various authorities. In continuation, Dr. Watts explained that the fact of the holding of several previous conferences had given sufficient means of indicating their scope and purposes. Their success in the past had afforded the best evidence of their utility. After reviewing the programme of meetings and excursions, the Commissioner explained shortly the reason why the Agricultural Conferences were held in January. It was simply a matter of the convenience of the delegates who were actively engaged in agricultural pursuits, especially in such islands as Barbados, Antigua, and St. Kitts, where the conditions of the sugar industry made it very inexpedient that they should leave their work at any other time of the year. Finally, in expressing his appreciation of the programme presented for his consideration, Dr. Watts reiterated his thanks to the Committee and sub-committee, making special reference to the work of Professor Harrison, as Chairman.

It only remains to be stated that the early preparation of the papers to be read by the delegates at the Conference will be of much assistance in carrying out the labours of organization in connexion with it. It need hardly be said that those members of the community who are interested in agriculture should give the delegates all the information and aid in their power, with the object of ensuring that matters of agricultural interest in the various colonies are fully brought forward. The papers should be presented in as concise a form as may be found expedient, in order that the time at the disposal of members, during the meetings, may be made of the greatest possible use.

SUGAR INDUSTRY.

THE INFLUENCE OF MOLASSES ON SOIL FERTILITY.

An article appeared in the *Agricultural News*, Vol. VII, p. 227, which described the work of Mr. W. P. Ebbels, of Beau Sejour, Mapou, Mauritius, on the fertilizing influence of molasses applied to sugar-cane soils.

As a result of the statements that were made in this article, it was decided that experiments to test the influence of molasses on the soil should be undertaken by the Agricultural Department in Antigua. These are described in the report on Sugar-Cane Experiments in the Leeward Islands, 1908-9, and in Pamphlet 64 of the Department Series. The investigations are being continued.

A communication has been received recently, from Mr. Ebbels, in which he refers to the experiments that are being conducted in Antigua, pointing out, with reference to the statement that the increases of yield obtained were doubtfully remunerative at the price at which exhausted molasses was then selling, that further consideration is required, in the light of the fact that experience in Mauritius has shown the effect to continue after the third ratoons. This result was obtained where the molasses was applied to the land before planting.

Mr. Ebbels goes on to state that, in 1908 a field of third ratoon Mauritius Seedling No. 33 was reaped, to part of which molasses had been applied before the field was planted. It was found that this portion of the field yielded 5 tons of cane per arpent (1·043 acres) more than the part which had received no molasses, the actual return being 24 tons against 19; although, with the exception of the treatment with molasses, the manuring and cultivation of the different parts had been exactly similar. It is pointed out that, though this was not a carefully conducted field experiment, the difference in yield seems to be quite sufficient to indicate that the effects of the molasses had not ceased during the three previous crops.

These results are supported by the experience of M. P. Boname, Director of the Station Agronomique, Mauritius. In the annual report of this station for 1908, a copy of which was sent by Mr. Ebbels, an account of experiments conducted at the station in connexion with the matter is given, and a statement is made that the effect of the influence of the molasses does not appear to be exhausted during the first year, but seems to make itself felt for some time. The actual statement is to the effect that the employment of molasses for manuring the soil, where no more useful substance is available, is a rational procedure. Whether the unmistakable results from it are due to the action of sugar contained in it on the development of useful soil bacteria, or to any other cause, it seems that they are more marked than those which would arise simply from the fertilizing substances contained in the molasses. In other words, the results obtained by the application of molasses to soil are greater than those which could be produced from the direct application of ordinary manures containing the same quantity of nitrogen, phosphorus and potash as there is in the molasses.

Attention is drawn by Mr. Ebbels to the fact that the results of the experiments conducted at the Station Agronomique show that, where molasses was used in addition to a complete chemical manure, the third ratoons yielded $3\frac{1}{2}$ tons of cane in excess of that from the control plot; the total yield for the four crops was 19 tons greater where molasses had been used. Where nitrogen was omitted from the chemical manure, the yield from the third ratoons, with molasses, was over $2\frac{1}{2}$ tons per arpent in excess of that from the control plot; for the four crops, in this case, the increase was $30\frac{1}{2}$ tons.

Further information is given to the effect that the use of molasses, in addition to the ordinary application of chemical manure, is made in the following way. The molasses is applied at the rate of 1 litre to each hole, two months before the canes are planted. This means an application of about 660 gallons per arpent, taking 3,000 holes per arpent, and it is stated that this does not seem to incur a very heavy outlay, for the purpose of obtaining 19 or 20 tons of cane.

The work that is being carried out at the Station Agronomique, Mauritius, in this connexion, will receive further attention in a future number of the *Agricultural News*.

DEMERARA SEEDLING CANES IN LOUISIANA.

In an article entitled 'The Increasing Popularity of the Demerara Seedlings', the *Modern Sugar Planter* for September 3, 1910, states that, from all sections of the State where D. 74 is grown, reports are heard that planters intend to increase the area in this seedling for the next cane crop. The reason for this is said to be the fact that this cane was able to weather the September storm of last year much better than the several varieties of home cane, even though the Demerara seedling appeared to have been the most seriously damaged by the storm. Both as regards tonnage and yield of sugar, the latter cane did far better than the home cane, during the 1909 harvest, and showed better health and vigour.

It has been the usual practice in Louisiana to plant D. 74 toward the end of the year. There is a likelihood, however, that its planting will be no longer confined to this season, for instances are on record where this variety, planted last spring, produced entirely satisfactory stands.

The cane D.95, which has not received as much attention as D.74, is nevertheless coming more into favour with planters. Where it has been planted to any extent, the general opinion seems to be that it is the equal of D.74, and that for new lands, it is the best cane obtainable. It shares with D.74 the superiority over home varieties, in the ability to resist storms.

Other points in favour of D.95 that are mentioned in the article are: that it resists the effects of inundations by tide waters better than any other cane; that it shades the ground more effectively than D.74; and that it yields superior material for spring planting.

The article concludes with the statement that both these seedlings, ever since their introduction into Louisiana, have been so carefully watched, and subjected to such careful growing tests, that their survival and continuance in favour seem to be sufficient proof of their being worthy cane varieties for a still further enlargement of areas in the parishes.

FRUITS AND FRUIT TREES.

THE BAMBARRA GROUND NUT.

In Bulletin No. 21 of the *Station Agronomique*, Mauritius, much attention is given to the Bambarra ground nut (*Voandzeia subterranea*), which is known in Mauritius as 'Pistache malgache', and in Madagascar as 'Voandzou'. It is from this bulletin that most of the information contained in the following article is taken. Interesting facts concerning the plant may also be found in the *Kew Bulletin*, 1906, pp. 68 and 192; and in *Der Tropenpflanzer*, Vol. III, p. 169 Short mention was made of it in the *Agricultural News*, Vol. V, p. 276.

ORIGIN. In the first of the references that are made above, to the *Kew Bulletin*, it is stated that the plant is of African origin, and that it derives its name of the Bambarra ground nut from a district on the upper Niger, near Timbuctoo This does not give a full idea of its occurrence, however, for it is cultivated throughout Tropical Africa, from the Sahara to Natal.

DESCRIPTION. The Mauritius bulletin, to which reference has been made, states that this plant belongs to the family of leguminous plants, and that it is thus capable of making use of the nitrogen of the atmosphere. It is somewhat similar to the ordinary ground nut (*Arachis hypogaea*), but its development of leaves is less abundunt; it affords a smaller amount of vegetable matter after it has been harvested, and its cultivation improves the soil to a smaller extent than that of the ground nut. None the less, it is claimed that the cultivation of this plant deserves extension, because it is capable of furnishing useful quantities of nutritious material, and because the digging of the nuts is conducted in a far easier and cheaper manner than that of ground nuts.

The two plants possess a similar vegetation, but the Bambarra ground nut forms its fruits around the principal stalk, and does not possess trailing branches. It produces a bunch of upright leaves, and the fruits are developed close around the stem, at a very small depth in the soil, so that they may be readily harvested by simply pulling up the bunch of leaves, when nearly all the nuts come out of the ground, attached to the stalk. It is thus seen that the produce of the plant may be quickly collected; the speed of harvesting is also increased by the circumstance that even those nuts that are left behind, when the plant is pulled up, all remain at the same, very small, depth below the soil.

The *Kew Bulletin*, 1906, p. 70, states that the fruit is very like that of the ground nut but that it is shorter, and usually only contains one seed, at maturity. It possesses a prominent ridge which forms a further means of distinguishing it from the fruit of the ground nut. There is a faint network of ridges on the sides; the total length of the pod is about $\frac{3}{4}$ inch. The resemblances to the ground nut are more superficial than otherwise for it belongs to a different tribe of the leguminous family, being much more closely allied to the Haricot bean. *Der Tropenpflanzer*, Vol. III, p. 170, describes the seeds as being almost spherical and of very varying, but always very pronounced, colours.

CULTIVATION. Returning to the bulletin that has been already quoted, this states that the requirements for the cultivation of the Bambarra ground nut are the same as those for the ordinary ground nut. It is planted and harvested in the same seasons; it covers the soil well, and as it only produces a bunch of upright leaves, it lends itself especially to cultivation between rows of sugar-cane. For this purpose, it is sown in small pockets, between the rows, at a distance of about 18 inches each way. In sowing, three or four seeds are put into each pocket, at a depth of about 1 inch.

The nuts are collected when the leaves commence to dry up, or this may be done a little sooner if it is desired to consume them while still green. If they are required to provide seed, it is preferable to wait for a short time before harvesting them in order to permit of their ripening completely in the earth.

YIELDS. The yields obtained from the Bambarra ground nut are at least equal to, and generally greater than, those from the ordinary ground nut. When cultivated between every other cane row, in the way described above, 960 kilos. of green nuts and 1,120 kilos. of green leaves have been obtained per arpent (1·043 acres). The undried (green) nuts, when harvested thoroughly ripe, only lose 50 per cent. of their weight on drying; whereas it they are dug a little before they attain maturity, they give scarcely 40 per cent. of dry nuts.

STORAGE. If it has to be kept for any time it is naturally necessary to permit the nut to ripen completely in the air and to dry it in the same way as this is done for the ordinary ground nut. It keeps well, when it is dry, and is not attacked in storage by insects, as far as has been observed in Mauritius.

COMPOSITION. The following is the percentage composition of the green nuts, the ripe nuts, and of the entire fruit, found at the Station Agronomique, Mauritius :—

	Green.			Ripe.		
	Nuts.	Shells.	Entire fruits.	Nuts.	Shells	Entire fruits.
Water	45·40	17·96	63·36	10·27	2·00	12·27
Ash	1·28	0·18	1·46	3·23	0·71	3·94
Cellulose	2·35	1·23	3·58	4·63	5·23	9·86
Fats	2·41	0·02	2·43	5·03	0·14	5·17
Sugar and starch	20·49	2·66	23·15	46·80	8·60	55·40
Albuminoids	5·67	0·35	6·02	12·04	1·32	13·36

The following table shows the composition of the leaves. Although the quantity of them produced is less than that from the ground nut, they contain a proportionately greater amount of nitrogenous matter. When they are allowed to dry, as harvested, their nutritive value is lessened; they form, however, an excellent manure. In the table, the percentage composition of the leaves is given, both on the fresh and dry matter, and after these have been dried at 100° C.:

	Ordinary.		Dried at 100° C.	
	Fresh leaves.	Dry leaves.	Fresh leaves.	Dry leaves.
Water	66·00	10·76	...	...
Ash	3·32	7·30	9·77	8·19
Cellulose	10·35	42·20	30·43	47·28
Fats	1·45	2·42	4·25	2·71
Sugar and starch	14.63	31·41	46·05	35·20
Albuminoids	4·25	5·91	12·50	6·62

In a general way, if the mineral composition of the two plants is compared, it is found that, for the same crop from each, the Bambarra ground nut contains a little less phosphoric acid than the ordinary one; its content of potash is, however, much greater, so that the former plant is much more exacting in this respect than the latter. Lastly, the nitrogen content of the ordinary ground nut is greater than that of the plant which is at present receiving special consideration.

NUTRITIVE VALUE. In the table which follows, the composition of the Bambarra ground nut is compared with those of rice, maize, lentils and cassava, the figures being expressed as percentages:—

	Bambarra ground nut.		Rice.	Maize.	Lentils.	Cassava.
	Green.	Ripe.				
Water	56·90	13·30	11·53	14·40	12·95	59·88
Ash	1·73	3·54	0·78	1·50	2·69	0·89
Cellulose	2·41	4·37	0·35	5·50	3·67	1·28
Fats	3·14	6·94	0·48	6·50	0·60	0·19
Sugar and starch	27·40	55·81	79·57	62·10	58·06	36·36
Albuminoids	8·42	16·04	7·29	10·00	22·03	1·40

It is an interesting fact that the composition of the Bambarra ground nut very closely approaches that of an ordinary, normal food ration. Even alone, it constitutes a complete food, so that unlike the others, it does not, from this point of view, require mixing with additional food stuffs, in order that it may present the chief food-bodies in proper amounts. Balland was almost the first to point out that the seeds of this plant form a food of this kind, and such as is capable of repairing the losses undergone in the animal body, without the addition of any other kind of nourishment. It serves as food best when it is not quite ripe; that is to say when the covering has not become completely dry.

USES. Most of the uses of the plant have been indicated already; they include the employment of the nut for food, both for human beings and stock; the use of the leaves as fodder; and the provision by them, either when fresh or dry, of a green manure.

When the seed is cooked before it is ripe, it gives a starchy, nitrogenous vegetable, which is much liked, possessing as it does a very agreeable taste somewhat like that of the chestnut. When it is ripe and dry, it may be cooked in the same way as beans and lentils; it does not contain, however, as high a percentage of proteids as these foods. When ground, it yields a very white meal from which excellent broths and soups may be made. Where the fruits are produced in large numbers they may be used as food for stock; in this case, the fact that the covering is consumed as well as the seed gives the product an additional nutritive value.

Seeds of this plant have been obtained by the Department from the Station Agronomique, Mauritius, and are now being distributed for trial among the experiment stations in the West Indies.

A NEW GREEN MANURE.

The foregoing article gives an account of a plant that has been recently introduced for trial in the West Indies. Seeds of another plant, which is at present claiming a certain amount of attention in Ceylon, as a green dressing, have also been obtained by the Department. These belong to the plant which has been called *Boja Medelloa*, and they are supplied by the Superintendent of Telbedde estate, Badulla, Ceylon. The plant belongs to the leguminous family, and produces large numbers of small, dark-coloured seeds.

According to the *Tropical Agriculturist* for February, 1910, p. 181, from which the account of this plant was obtained originally, it is being strongly recommended as a green manure for tea and rubber, and the statement is made that it will be a valuable addition to the available green manures of Ceylon.

The trials to be made with this plant, as well as with the one described in the article above, which are to be conducted at the various experiment stations under the Department, will be watched with much interest.

THE PRODUCTION OF NITRATE OF SODA, 1909-10.

The Chilian Nitrate Combination, which formerly regulated the production of nitrate of soda, was dissolved in 1909. Mr. Consul Hudson, in his report on the trade of the district of Iquique, Chile (*Foreign Office Reports*, Annual Series, No. 4510), states that in the first year of free production (April 1, 1909, to March 31, 1910) there has been an increase in the total output of 7,732,325 quintals of 110 ℔., as compared with the output during the last year of the Combination (April 1, 1908, to March 31, 1909); whilst the world's consumption in the year 1909 (January 1, to December 31,) shows an increase of 4,559,769 quintals over that of the previous year. The average price of nitrate for 95 per cent. f.o.b. was 8*s.* 7½*d.* per quintal in 1907; in 1908 it was 7*s.* 6¼*d.*, while in 1909 it fell to 6*s.* 10½*d.* per quintal.

The possibility of an immediate renewal of the Combination appears to be doubtful, although there is an indication that those who were opposed to it and were the cause of its non-renewal are now more favourably disposed to something being done in this direction. If this should be brought about prices would no doubt rise. (The *Journal of the Board of Agriculture*, September 1910.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 11, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 200 bales of West Indian Sea Islands have been sold, chiefly at about 18*d.* to 18½*d.*, with a few St. Vincent at 21*d.* to 24*d.*, and some Stains at 11*d.* to 12*d.*

The American Sea Island market seems to have steadied for Floridas round about 16½*d.* for the best, but the market for Islands has not yet opened.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 8, is as follows:—

The receipts to date are only 92 bales, against 325 bales last year. The factors have not yet sampled their receipts, and do not propose doing so until the coming week. We are, therefore, unable as yet to give quotations.

THE EGYPTIAN COTTON CROP, 1909.

The following note by Mr. W. H. Cadman, B.Sc., F.C.S., dealing with cotton in Egypt during 1909, appears in *Diplomatic and Consular Reports*, No. 4554 Annual Series:—

The past year has been a notable one in the history of Egyptian agriculture. In spite of favourable climatic conditions and a plentiful supply of water, the cotton crop upon which the prosperity of Egypt so largely depends, was most unsatisfactory both in yield and quality. Considerable advance has been made in investigating the causes of this depreciation. In order to obtain trustworthy data to assist the Commissions inquiring into the matter, the Government gave instructions to the Survey Department to make a systematic survey of the total area planted with cotton during the past season. A mean value of 1,526,600 feddans was obtained for the area under cotton in 1909. (*Collection of Statistics of Areas Planted in Cotton in 1909.*) There is no indication from the statistics that land of poor quality is being cropped with cotton to any considerable extent. The change from triennial to biennial rotation, which is practised chiefly by the smaller cultivators, is considered capable of accounting for some of the decrease in yield. In September 1910, the Alexandria Produce Association will publish its figures for the total yield of last year's cotton crop based on the export figures of the Customs Administration, after allowing for any cotton held over from the previous year. There will then be available for the first time reliable statistics of both yield and area.

The cotton worm and boll worm were responsible for much of the damage. The experiment, repeated last year, of substituting native inspectors for Europeans to supervise the destruction of the cotton worm was again most unsatisfactory. In future, experienced Europeans will be reappointed to organize the campaign against these pests more efficiently. The Government intends making every effort within its power to prevent this valuable possession from further deterioration. A law has recently been passed requiring all cotton stalks to be uprooted before the end of December.

During the past year, special attention has been drawn to the subject of the underground or subsoil water of Egypt, both by official and non-official publications. Egypt is an exceptional country, in that the rainfall is seldom taken into account when agricultural projects are being discussed. In most countries the rainfall is the prime factor which governs the agricultural conditions, and, in consequence, endeavours are made to get rid of the superfluity of water, rather than to husband a certain limited quantity. 'It would seem that a permanent rise of the water-table has been produced by converting basin lands into perennially watered lands.' (Note on Subsoil Water of Egypt, H. T. Ferrar. *Cairo Scientific Journal*, Vol. III, No. 28.)

The Survey Department, the Khedivial Agricultural Society and the State Domains Administration have been experimentally investigating this matter. The general conclusion is that the rise of subsoil water, caused by infiltration from high level canals, or by over-watering of crops, is another cause for the deterioration in output and quality of the cotton. Concisely put, 'Egypt is becoming water-logged' (Cotton Investigations, W. L. Balls. *Cairo Scientific Journal*, Vol. III, No. 29) by the rise in the level of the stagnant water, which prevents the development of the roots of the plants. The result is that, while in former years there was little or no need for drainage, at the present time drainage is urgently needed to prevent this subsoil water washing up injurious salts, ruining the bacterial flora, and reducing the effective depth of soil.

Mr. W. Lawrence Balls, who is in charge of the Egyptian Mendelian Experiment Station, suggests as a possible remedy the breeding of early maturity cottons, which will ripen before the water-table has risen to the plant roots. However feasible this may be in the future, it will take several years to obtain a cotton with these characteristics, so that facilities should be made for all farmers in Egypt to have their lands drained. Efficient drainage, though very costly, is justified by the recent loss per acre per annum.

'It is a striking tribute to the fertility of the country that this loss, almost disregarded till last year, on a single crop is about as much as the ordinary profits which an English farmer makes on the same area in an average year.' (Cotton Investigations, W. L. Balls. *Cairo Scientific Journal*, Vol. III, No. 29.)

The factors which affect the situation from the side of supply and demand, with special reference to the position of the Lancashire cotton industry, have been investigated by Mr. J. A. Todd, Lecturer on Political Economy, Khedivial School of Law, Cairo. He states that 'the falling yield of recent years has raised the price to a figure which threatens the special market of Egyptian cotton with serious American competition... For the middle-class fabrics which form a large part of the trade the manufacturers are being compelled by the high price of Egyptian to substitute American whenever possible.... Spinners are beginning to devise machinery to adapt American cotton to the products for which Egyptian cotton has always been used.... If by any chance the quality of the Egyptian crop deteriorates as seriously as the quantity has done, nothing will save the Egyptian from a fall in price to something little above that of the American. Egypt can never reach America in quantity, so that this price means to Egypt the ruin of her staple industry.' (*Extrait de l'Egypte Contemporaine*, Tome I, pages 277-86.)

THE WEST INDIES AND THE CANADIAN EXHIBITIONS, 1910.

Most of the information in the following article, which presents an account of the recent Canadian Exhibitions, in their special relation to the West Indies, has been supplied by Mr. W. N. Sands, the representative of the Imperial Department of Agriculture at those exhibitions.

THE TORONTO EXHIBITION. The National Exhibition at Toronto was open from August 29 to September 10, and was attended by 800,000 persons. The West Indian court was placed in the large agricultural hall in the exhibition grounds, where it occupied the whole of one wing, covering a space of 2,400 feet. It is a matter of interest that the rent of this space, which was granted free, would have been about £500, had it been obtained on the terms given to ordinary, commercial exhibitors. The exhibits from the islands and British Guiana were placed on a structure built on turned wooden columns, surmounted by a plain cornice, and painted white and green. The stands for the exhibits, which were of different shapes and sizes, suited to the uses for which they were required, were painted white, and draped with green burlap. The exhibits were arranged on these in tiers, as far as possible. Loans of live plants to provide decorative material were made, to a great extent, by the Exhibition Authorities, and the rest of this was provided by some of the colonies, more especially Jamaica. It is not likely that any great future increase in the amount of such material provided by the colonies will be possible, on account of the high cost of its carriage to Canada.

Jamaica sent the largest exhibit; this occupied about one-third of the court. The main exhibits consisted of economic plants in flower and fruit; jippi-jappa hats in all stages of manufacture, with specimens of the straw from which they are made, and an example of the growing plant (*Carludovica jamaicensis*) which provides this; cigars and tobacco; sugars, molasses and rum; cacao; coffee; fruits, including bananas; spices; curios, including seed work and lace bark; and a large number of photographic views of the island.

The exhibits from Barbados included chiefly sugars, molasses and rum; cotton and cotton-seed oil; manjak; yams and sweet potatos; and photographic views of the island and of its main industries.

From Antigua there were sent sugars and molasses; cotton and cotton-seed; lime juice; seed work and other exhibits of less importance. Unfortunately, many of the exhibits from this island were spoiled while in transit, owing to the breakage of packages in the cases.

The island of Montserrat sent chiefly limes, including samples for distribution; lime juice; otto of limes and distilled lime oil; preserves; cotton lint and seed-cotton; and lemon grass oil.

The exhibits from St. Kitts-Nevis and the Virgin Islands intended for the Toronto Exhibition did not reach their destination on account of the fact that they were not labelled adequately. They were therefore sent to the Dominion Exhibition at St. John.

Accounts of the exhibits from Trinidad, St. Vincent and the Virgin Islands, and from St. Lucia, appeared on pages 291 and 318, respectively, of the current volume of the *Agricultural News*, to which reference is made.

Chief among the material sent from British Guiana were sugars, molasses, molascuit and rum; rices; citrus fruits; cacao; coffee; green-heart logs and specimen blocks of other timbers such as mahogany, mora, purple heart; balata; confectionery; and a large map of the colony.

THE ST. JOHN EXHIBITION. The attendance at the Dominion Exhibition at St. John was 124,000, and it was open from September 5 to 15. The West Indian court at this exhibition occupied a space of 900 square feet on the upper floor of the main exhibition building. Its arrangement was somewhat similar to that of the one in Toronto, but it was not so elaborate and there was much less decorative material.

Barbados, Antigua, Montserrat, St. Lucia, St. Vincent and British Guiana sent what were practically duplicate sets of the exhibits that were forwarded by them to Toronto. There were, in addition, an exhibit from Dominica, and those from St. Kitts-Nevis and the Virgin Islands which did not arrive at Toronto, as has been explained already.

The Dominica exhibits included chiefly limes, lime juice, otto of limes and distilled oil of lime; other citrus fruits; mangos; cacao; coffee; spices; starches; and Carib baskets.

The material sent from St. Kitts-Nevis was composed mainly of sugar, molasses and rum; preserves; pickles; and cotton seed meal and cotton cakes.

Dealing with the exhibitions generally, it may be said that great interest was evinced at Toronto in the exhibits from the West Indies, which were considered to form one of the most instructive features of the exhibition, so that the court was thronged continually. The various handbooks that were distributed, including *The West Indies in Canada, 1910*, published by the Imperial Department of Agriculture, filled a very useful purpose. On the whole, the exhibition was eminently successful; while that at St. John, although it was on a smaller scale, was of considerable interest.

A communication from Messrs. Pickford and Black, to the Imperial Commissioner of Agriculture, shows that the following awards were obtained at the Toronto Exhibition by the West Indies:—

BARBADOS. Gold Medal and Diploma, Permanent Exhibition Committee. Diplomas, Mount Gay Plantation, Local Department of Agriculture and Mr. C. Y. Simpson.

ANTIGUA. Gold Medal and Diploma, Permanent Exhibition Committee. Diplomas, Antigua Cotton Company, Messrs. G. W. Bennett, Bryson & Co., Mac.Donalds & Co., and the Antigua Sugar Factory.

MONTSERRAT. Gold Medal and Diploma, Permanent Exhibition Committee. Diploma, Montserrat Preserving Company.

ST. LUCIA. Gold Medal and Diploma, Permanent Exhibition Committee. Diploma, St. Lucia Agricultural Society.

ST. VINCENT. Gold Medal and Diploma, Permanent Exhibition Committee. Diplomas, Messrs. C. J. Simmons, H. Hayward, P. F. Huggins, C. A. Hadley, Mc.Monald Bros., and J. H. Hazell, Son & Co.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. IX. SATURDAY, OCTOBER 29, 1910. No. 222.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number has reference to the Agricultural Conference to be held in January 1911. It gives particulars of a preliminary and provisional scheme which has been outlined in connexion with this conference.

Under the heading of Sugar Industry, an interesting article on the influence of molasses on soil fertility is given on page 339.

Pages 340 and 341 present accounts of two interesting plants that have been obtained from Mauritius and Ceylon, by the Department, for trial in the West Indies.

An account which deals with the interests of the West Indies at the recent Canadian Exhibitions is given on page 343.

The Insect Notes, on page 346, give information as to recent work that has been conducted in relation to frog-hoppers in Trinidad.

The annual reports on the Botanic Stations, etc., in St. Kitts and Montserrat, are reviewed on page 347. A review is also given of the report of the Entomologist to the Trinidad Board of Agriculture, 1909-10.

As has been stated, the frog-hopper in Trinidad receives attention in the Insect Notes. Facts in relation to a fungus which is destroying this pest, in that island, are presented in the Fungus Notes, on page 350.

Crude Oil Emulsion for Cattle Ticks.

Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, India, draws attention in the *Planters' Chronicle* for July 16, 1910, to the use of crude oil emulsion as a remedy for cattle ticks, emphasizing more particularly its cheapness.

It is pointed out that, while the treatment of cattle with Paranaph costs about 2*s.* per head, annually, that with crude oil emulsion can be effected by an expenditure of about 2½*d.* per head per annum.

The greater expense in using the former mixture is understood, when it is considered that 75 lb. of it contains 50 lb. of soap, 6 lb. of napthalene, and 13 lb. (2 gallons) of oil, while crude oil emulsion contains 80 per cent. of crude oil.

It is evident that this method of treating cattle for ticks has a special application in reference to Trinidad and Barbados, where crude oil occurs naturally.

Ramie Wool.

The *Tropical Agriculturist* for August 1910, p. 108, gives an abstract from the *Indian Agriculturist*, Vol. XXXV, No. 4, which describes a new development in connexion with the ramie plant (*Boehmeria nivea*). This consists in the treatment of the fibre, on the fields where it is grown, in such a way as to produce from the fibre-yielding bark of the plant a material which is quite different from any fibre having a similar source. The product is a soft fibre which has been called 'processed ramie', and which may be shipped by the planter to the manufacturer, who simply passes it through a carding machine, when ramie 'wool' is obtained, which felts, and may be spun at once. It has a special value in that it forms a very good mixture with cotton, sheep's wool, etc.

The process for the production of processed ramie is said to be very simple, so that it can be worked by the ordinary labour at the command of the planter; it does not require the use of any chemicals, and the machinery employed is similar to that used for scutching.

The material has been exhibited in London, and is stated to be valuable as a wool. Yarn has been produced from it, and this has been woven mixed with natural wool, wool rags, and waste wool and flocks. The cloth obtained is strong and warm, has a good appearance, and may be dyed successfully.

It is estimated that the cost of treating 1 ton of dried ramie canes would not exceed, in India, 7*s.* This does not include the cost of passing them through the scutching machine, which would amount to about 11*s.* per ton. By means of the process, it is claimed, more ramie is extracted from the cane than can be obtained in any other way.

A machine capable of producing 5 cwt. of processed ramie daily may be obtained for £20; its action is simply to eliminate the bark, with very small destruction of the fibre. Enquiries in connexion with the machines may be made to Mr. Robert G. Orr, 708, Salisbury House, Finsbury Circus, London.

A Promising Weed.

Under this heading, the *Agricultural Journal of India* for April 1910, page 165, gives an account of *Melilotus alba*, or wild lucerne, as it is called, on account of its close resemblance to cultivated lucerne. This grows, during the dry season, to a height of about 3 feet and is readily eaten both by horses and cattle. It is therefore recommended as a dry season fodder crop.

It is thought that *Melilotus alba* will also prove to be of much use as green manure. Its value as such has not yet been completely tested, but it has been observed to give an increase in the rice crop where it has been ploughed in, previous to sowing.

The plant is a biennial, and has been found to grow readily on rice lands which are fairly retentive of moisture. As it is a weed, it is hardy and can be raised with a minimum amount of attention. Investigations are in train for the purpose of obtaining further, more definite information concerning this plant, in relation to the uses for which it has been devised.

Trade of Sierra Leone, 1909.

Information concerning the following agricultural exports from Sierra Leone is given in *Colonial Reports* Annual, No. 648.

The quantity of kola nuts (which amount to more than 20 per cent. of the total export) that were shipped in 1909 was 1,324 tons, value £153,919, as compared with 1,162 tons, value £108,895 in 1908. The prices obtained for this product during 1909 were higher than those of the previous year. The chief use of the nuts by the natives in the Protectorate is, of course, in relation to their property as a tonic stimulant: one nut, well chewed and eaten, will sustain a man for a whole day without food. There is no intoxicating or reactionary effect after its use: though its taste is very bitter and astringent.

There was an increase in the amount of the staple product of the colony—palm kernels—of 9,176 tons over the quantity exported in 1908. This increase is one of 27·2 per cent., and is valued at £149,727. The enhanced supply of these, as well as of kola nuts, is caused mainly by the greater facilities for transport and a wider knowledge of market prices, so that the native places greater confidence in traders.

The palm oil produced in the Protectorate is meeting a regular and consistent demand. The exports during 1909, were 851,999 gallons of the value of £64,273—an increase over the quantity exported in 1908 of 362,362 gallons, of the value of £27,822. The oil is a staple food throughout the Colony and Protectorate, and its many domestic uses make it impossible to estimate, even approximately, the quantity that is used for home consumption.

The export of ginger during the year amounted to 722 tons, value £14,147, as compared with 637 tons, value £11,871, shipped in 1908. The opinion is expressed that the increase in production of this commodity should be greater. Prices are low, mainly on account of the rough methods that are employed in the cleaning and preparation.

The exports of other agricultural products were as follows: piassava, 675 tons, value £9,859; rice 55,537 bushels, value £10,034; gum copal, 46 tons, value £5,036; and rubber, 26 tons, value £8,079. There were increases in the amounts of these, over those of 1908, in all cases except that of rubber. As regards the last-named product, it is stated that Sierra Leone is not at present a rubber-producing country, though there appears to be no reason why it should not export a larger amount of the indigenous product.

Cane-Planting in India.

An account of experiments with material for planting sugar-cane is given in the *Agricultural Journal of India*, for April 1910, p. 178. The trials originated partly from the fact that a large number of cuttings, taken from the middle of the cane ('middles') and planted in irrigated land, failed to sprout, so that the holes were supplied with tops which were cut from standing canes. A few days after the tops had been removed, it was seen that the buds on the topped canes were swelling, and that they appeared as if they would supply good planting material. An experiment was made in order to ascertain if this was the case, when it was found that a better and earlier stand of cane was obtained than when ordinary, unsprouted tops, or cuttings were used.

In relation to this matter, the conclusion is therefore reached that, from the point of view of germination, cuttings showing signs of sprouting are preferable to tops, for planting, the only circumstance in favour of the latter being the economy effected by their use.

Banana Meal.

A short article under this title appeared in the last number of the *Agricultural News*, the information for which was taken from *L'Agronomie Tropicale* for May 1910. In the same paper it is stated that banana meal has a high value as food, but that the difficulty has been, in the past, to prepare it in a form in which it may be used readily as such. Attempts to make bread from it in the ordinary way have been abandoned. It has also been mixed with ordinary flour for the same purpose, but the result has been to obtain loaves which taste of straw. It is only by making a paste of the meal, by submitting it to the action of steam, under pressure, that bread having an agreeable taste has been obtained.

It is because of this discovery that various products obtained from banana meal, and known in commerce under such names as Bananine, are now being manufactured in England. Attempts are being made to introduce similar substances into the continental markets. In connexion with these, a Swiss firm has recently produced a banana chocolate which surpasses oatmeal chocolate both in respect of the nutritive value and of the aroma.

INSECT NOTES.

FROG-HOPPERS IN TRINIDAD.

Considerable interest attaches at present to the damage inflicted on sugar-cane in Trinidad by insects known as frog-hoppers. These are generally found associated with a condition of the canes known locally as blight. Extensive investigations into the life-history and general habits of these insects have been made recently in Trinidad by Mr. F. W. Urich, Entomologist to the Board of Agriculture. A paper dealing with this subject was published in the *Bulletin of the Department of Agriculture*, Trinidad, Vol. IX, p. 15, and an interim report by the same author has been recently issued: the following article is based upon the information contained in these.

Frog-hoppers belong to the family Cercopidae, of the order Hemiptera, sub-order Homoptera. Three species are known to occur in Trinidad, all members of the genus Tomaspis, of which the most important would appear to be *Tomaspis postica*, Walker, though another species, probably *T. bicincta*, is apparently also of fairly general distribution. These insects are related to the scale insects and aphids, and are all found attacking living plants, obtaining their food-supply by sucking the juices, as do the other types of insects mentioned.

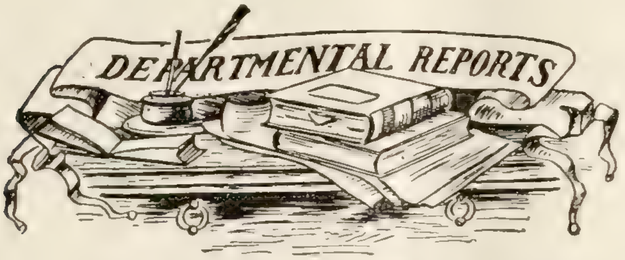
Frog-hoppers have been known to occur for some time in Trinidad, and several publications on the subject have been issued from time to time, particularly in the *Proceedings of the Agricultural Society of Trinidad and Tobago*. Full reference to these articles is given in the paper by Mr. Urich mentioned above. In addition to Trinidad, the insect is reported as occurring in Central and northern South America from Mexico, Nicaragua, Costa Rica and Demerara, and also probably from British Honduras. Canes which are affected become stunted in growth, and the leaves become spotted and eventually die off. The lower leaves become diseased first, but the upper ones are eventually attacked; and if the insects are numerous, the damage done may be so severe that nothing but the bare cane is left standing. In some instances, when the severity of the insect attack has been reduced by dry weather, the canes may recover to a considerable extent.

LIFE-HISTORY. The eggs are deposited in dry cane and grass sheaths near the ground, or they may be found sticking to grass stems, just below the surface of the ground. The egg stage may continue, under favourable circumstances, from twelve to twenty days, the main requisite for hatching being a sufficiency of moisture. If the weather is dry, the eggs may remain dormant for as much as four months. On hatching out, a nymphal stage follows, which lasts for a period of thirty-two to forty-two days. In this stage, the insects are surrounded by a covering made up of bubbles of fluid, and this gives rise to their popular name of spittle insects. They attach themselves by means of this froth to the young roots of cane or of various grasses, notably of the Savannah grass of Trinidad, Para grass (*Panicum muticum*) and Razor grass (*Scleria scindens*), as well as of various other grasses, and of some herbaceous plants. They are quite active, and can crawl about, often changing their position several times, in order to obtain a fresh food-supply. During this stage, the insects change their skin four times, the wing pads becoming visible during the third and fourth stages. Just before changing its skin for the last time, the nymph ascends a grass or cane stalk to a height of from 1 foot to 2 feet, and undergoes the final moult in a kind of chamber hollowed in the froth surrounding it. The adult insect of *Tomaspis postica* is about 8 mm. in length; the head and prothorax are bronze with tawny bands; the width across the wings varies. On emerging from the spittle chamber, the adults crawl up the stems of grasses or canes, and secrete themselves in the axils of the leaves or in the folds of unrolling leaves. They remain in this position until dusk, after which they emerge and crawl out and move about on cane or grass leaves. They may be found feeding at this time, or taking short leaps from leaf to leaf either in search of additional food, or of mates; or they may be found crawling about the ground. They also feed during the day, when secreted in the leaves. As the eggs are laid separately and may take different lengths of time to hatch out, depending upon the moisture supply of the situation in which they are laid, it naturally results that the broods are continuous, and that practically all stages in the life-history may be found at any time during the year, unless the weather is exceptionally dry. The insects can tide over such a period of drought, when in the nymphal stage, by sheltering under heaps of trash, or on grass growing as a weed on cane fields, as well as in cracks in the soil.

METHODS OF CONTROL. Two principal methods have been employed for reducing the numbers of these insects. The first consists in destroying them by means of light traps at night. These traps are made of ordinary hurricane lanterns, standing on bricks in common baking pans filled with oil and water. Each trap is placed on a small mound of earth about 1 foot high, and several are usually employed in each field, at intervals of about 50 feet. By the use of forty-eight traps of this type, as many as 252,559 insects were captured on one estate in Trinidad, in one night. The second means of control consists in keeping the fields weeded as cleanly as possible, until the canes are old enough to keep down the weeds for themselves. After the field has been clean weeded and the trash removed, it is found that a careful application of a contact insecticide, such as kerosene emulsion produces very good effects, if carefully applied. The mixtures recommended are kerosene emulsion diluted 1 in 10, kerosene lysol emulsion 6 per cent., and cyanide of potassium 1 oz. to 1 gallon of water. These should be applied by means of a knapsack sprayer. Each stool of cane must be thoroughly drenched, and the spray should also be applied to the ground between the cane rows. The spraying should be repeated at intervals of three weeks. The best time of the year for applying the sprays is immediately after the crop and before the rains commence. It should further be pointed out that all weeds and trash removed from infected fields should be burned or deeply buried, and that in serious attacks it may even be found advisable to strip the canes completely of all their trash, and to collect this carefully and burn it.

NATURAL ENEMIES. The only natural control of any consequence which has so far been observed is that of a fungoid disease which occurs on both the adults and the nymphs in Trinidad. Some account of the work which has been carried on with this fungus in Trinidad appears elsewhere in this number of the *Agricultural News*, under the heading of Fungus Notes.

In addition to that in the publications mentioned above, information is given in the *Agricultural News*, Vol. V, p. 330, and in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, Vol. VIII, part 9, the latter of which has just come to hand. In this, a paper is given by Dr. Gough, who first discovered the eggs of the frog-hopper, a few days before this was done by Mr. Urich.



ST. KITTS-NEVIS: REPORT ON THE BOTANIC STATION, ECONOMIC EXPERIMENTS AND AGRICULTURAL INSTRUCTION: ALSO ON AGRICULTURAL EDUCATION, 1909-10.

This report shows that the total expenditure in connexion with the work which it describes was £1,085 18*s.* 8*d.*, of which £766 18*s.* 9*d.* came from the Imperial Grant-in-aid. The total receipts from the sale of plants and produce were £148 7*s.* The buildings and nurseries at the stations have been kept in good order. A small laboratory has been equipped at the Grammar School for the use of the agricultural pupils. The total rainfall at the Botanic Station, St. Kitts for the period under review, was 42·91 inches; in the previous year it was 48·10 inches.

Useful work has been done in regard to the fumigation of imported plants and seed, under the Plant Protection Ordinance. This forms part of the most important duties of the Agricultural Superintendent. As in Antigua, the Cadet System in vogue at the Botanic Station is meeting with success; the system is followed in much the same way in the two colonies. The economic and other experiments carried on in connexion with the Botanic Station, St. Kitts, included trials with food crops, green dressing plants, broom corn, tobacco, cotton, limes and varieties of sugar-cane. A large distribution has been made of the produce from some of the plants. The part of the report describing these experiments is rendered all the more interesting by the circumstance that the results, in many cases, are derived from investigations extending over several years. The manurial experiments with cotton continue to indicate that the best returns from this crop are obtained, in St. Kitts, by good cultivation, and by the use of farmyard manure to maintain the condition of the soil. Valuable results are being obtained with respect to cotton selection; the most useful of these are given in detailed tables. A part of the report that is of much interest deals with the cotton industry of St. Kitts, Nevis and Anguilla, and with the sugar industry of St. Kitts.

The report on the station in Nevis shows that a large and useful distribution of plants is taking place, under the auspices of the Agricultural Department. This distribution is concerned mainly with the dissemination of good varieties of sugar-cane. Particulars are given of experiments with food crops, green dressings and cotton. The rainfall at the Botanic Station in Nevis was 50·69 inches; this is almost the same as that for 1908, which was 50·50 inches.

Accounts of the sugar and cotton industries show that, with regard to the former, the yield of sugar was disappointing, even though a good rainfall had been received during the growing season; an experiment is being conducted at Pinney's estate for the purpose of ascertaining the varieties of cane that are most suited to conditions in Nevis. Satisfactory prices were obtained, during the season, for cotton.

The report of the work of the Agricultural and Science Master at the St. Kitts Grammar School shows that this is being continued on the some lines as those of former years, and that satisfactory progress is being made.

MONTSERRAT: REPORT ON THE BOTANIC STATION AND EXPERIMENT PLOTS, 1909-10.

The financial statement at the commencement of this report shows that the total expenditure during the year was £615 7*s.* 1*d.*; of this sum £567 6*s.* 2*d.* was granted from Imperial funds. The amount received from the sale of plants and produce was £27 5*s.* 6½*d.* Various minor improvements have been effected at Grove Station. The station at Olveston has proved itself unsuitable for the purposes of agricultural experiments, and has therefore been closed. There has been a large distribution of plants during the year. The account of the trials conducted on the experiment plots shows that much interesting work has been done in regard to cotton selection—work that is becoming of increasing importance. Of large importance, too, are the experiments that are being made in lime cultivation; these receive detailed attention in the report. The trials on the various experiment plots include those with food crops, lemon grasses, bay trees and cacao. A general account is given of the commoner diseases and pests in Montserrat.

Interesting details with respect to the cotton industry show that the area planted in cotton was about 1,600 acres; this is 700 acres less than the area in 1908-9. The amount of lint shipped to the end of June 1910 was 235,021 lb.; the crop of 1908-9 gave 224,711 lb. The season, on the whole, was favourable for the crop, and prices ranged from 1*s.* 7*d.* to 1*s.* 10*d.* per lb.

The rainfall at the Grove Botanic Station during 1908-9 was 76·71 inches.

TRINIDAD: ANNUAL REPORT OF THE ENTOMOLOGIST TO THE BOARD OF AGRICULTURE, 1909-10.

This report shows that most of the attention of the entomologist, since January of this year, has been given to the study of the frog-hopper (*Tomaspis postica*). An account of the work that has been done in relation to this pest is given in the Insect Notes and Fungus Notes of this number of the *Agricultural News.* The other sugar-cane pests that received attention were the giant moth borer (*Castnia licus*), the small moth borer (*Diatraea saccharalis* and an undetermined species), the striped grass looper (*Remigia repanda*), the gru-gru beetle (*Rhynchophorus palmarum*), and the small beetle borer (*Sphenophorus piceus*). Among these, the giant moth borer was responsible for a large proportion of the 'dead hearts', and treatment by cutting out and burning is recommended. The best means of control for the striped grass looper was found to be weeding, for when this was done, the caterpillars were picked from the ground by the savannah blackbird (*Quiscalus crassirostris*) and the tick bird (*Crotophaga ani*). Shot borers (*Xyleborus perforans*) were not numerous during the year.

The cacao pests dealt with are: the cacao beetle (*Steirastoma depressum*), the leaf hopper (*Horiola arquata*), which is protected by ants when young; and *Heliothrips rubrocintus.*

Of the pests of cocoa-nuts, the following received attention: the bearded weevil (*Rhina barbirostris*); the gru-gru beetle (*Rynchophorus palmarum*); *Sphenophorus* sp.; *Xyleborus perforans*; a rhinoceros beetle (*Oryctes* sp.); *Brassolis sophorae*; and the scale insects *Vinsonia stellifera*, *Aspidiotus destructor* and *Icerya montserratensis.*

After making reference to various miscellaneous insects of interest, the entomologist finally draws attention to the importance of the despatch of specimens to him, in order that he may be assisted in his work.

GLEANINGS.

Information has been received from the East Java Sugar-Cane Experiment Station, Pasoeroean, Java, that Mr. J. E. van der Stok has been appointed to the post of Director of that station, in the place of the late Mr. J. D. Kobus.

It is of interest that the distribution of plants from the Dominica Botanic Station during last month was as follows: limes 4,150, Para rubber 1,000, cacao 300, budded citrus plants 70, grafted cacao 40, grafted mangos 9, making a total distribution, for the month, of 5,569 plants.

It is reported from St. Lucia that the cotton crop made favourable progress during last month, and that very little Paris green had been required, so far. There were indications, however, that the cacao crop was likely to be late. The planting of limes was continued, to a fair extent.

The *Board of Trade Journal* for September 15, 1910, p. 551, shows that the exports of cultivated rubber from the Federated Malay States during the six months ending June 1910 were 5,276,793 ℔.; while for a similar period in 1909 the amount was 2,463,241 ℔. The shipments for June 1910 amounted to 879,675 ℔.

The condition of the sugar crop in Barbados is good, on the whole; although the canes have been kept back to a certain degree near the sea-coast in Christ Church, through insufficient rainfall. Cotton sowing was practically completed by the end of September, and the general prospects of the new crop may be said to be excellent.

A report by the acting Superintendent of Agriculture for the Leeward Islands, Mr. F. R. Shepherd, shows that there is a likelihood that promising results will be obtained from much of the early planted cotton in Antigua. It emphasizes the importance of getting cotton fields in that island, into a state of tilth fit for planting early, so that seed may be sown immediately on receipt of the first rains.

The report of the Agricultural Instructor, Nevis, for the month of September, shows that a satisfactory rainfall has been experienced, with the result that agricultural conditions have improved in the island generally. Complaint is made, however, that sufficient precautions are not being taken, by some of the peasantry, in the direction of controlling the cotton worm, thus causing hardship to those who are exercising care in this matter.

The report of the Agricultural Instructor, St. Vincent, for last month, shows that the cotton being grown on allotments, under the Land Settlement Scheme, was making good progress generally. The conditions on private estates were good, and the cotton was making satisfactory growth on most of these, so that with a favourable ripening season, good yields should be obtained. Where implemental tillage has been adopted, an improvement in the crops was seen, in every case.

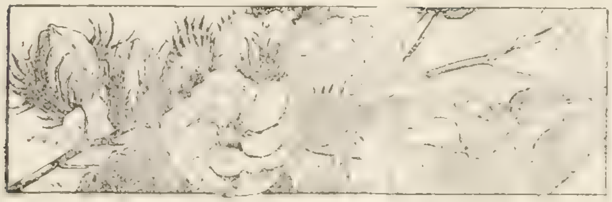
Recent issues of the St. Kitts *Daily Express* have contained a Government Notice to the effect that, in consequence of the existence, in that colony, of a certain amount of anxiety in regard to the danger of diseased meat being sold, the Central Board of Health was taking special measures to ensure the slaughter of perfectly healthy animals, in the public market. Precautions were also taken in relation to the importation of cattle from Nevis, where the disease that had broken out was abating steadily.

The attempts that are being made to introduce the Barbados blackbird (*Quiscalus fortirostris*) into Antigua appear to be meeting with success. These have been made chiefly at Cades Bay, where, according to Miss Johnston, who has kept them under observation on this estate, there were two in 1908, eleven in 1909, and seventeen in 1910. Recently, nine more birds were imported from Barbados, which on being liberated, immediately joined the existing flock.

A report received from the Curator of the Botanic Station, Montserrat, for last month, shows that the cotton crop in that island had not received any check so far, and that, generally, the prospects were good. Bacterial disease was spreading, but the extent of the damage done by it had not yet been ascertained. Observations on the cotton growing on some of the lighter soils indicated that planting had been too close. The cotton worm was in evidence at the close of the month, but leaf-blister mite had not become prevalent, so far.

An account is contained in the *Natal Agricultural Journal* for August 1910, page 207, dealing with trials of various machines for gathering stones. The best machine appears to be that invented by Messrs. J. and R. Forgan, of Port Pirie, which gained 83 per cent. of the marks awarded for the various useful characteristics. At the time of the tests, the general opinion was that the picking up of the stones by this machine was better than that done by hand. The machine passed over large stones and fixed stumps without injury, and it is capable of treating 8 to 10 acres a day, when worked by a 5-horse team and one man.

An abstract of a paper in the *Experiment Station Record* of the United States Department of Agriculture, for July 1910, p. 16, shows that natural waters are enabled to free themselves from bacterial contamination owing to the presence in them of minute forms of animal life (protozoa), which destroy the bacteria much in the same way as this is done by similar animals in the soil (see *Agricultural News*, Vol. IX, pp. 34 and 323). The rate of purification of the water is dependent upon the speed with which the protozoa grow, and this in turn is directly affected by the activity of the protozoa, which is influenced chiefly by the amounts of bacterial products in the water.



STUDENTS' CORNER.

NOVEMBER.

First Period.

Seasonal Notes.

It has been found advantageous, in planting pine-apple suckers, to strip off the lower leaves before putting the suckers into the ground. What difference does this make to the growth of the roots, and how does it assist in the prevention of the access of the condition known as 'tangle root'? What is the appearance of the roots of a pine-apple plant showing this condition? In what way does it interfere with the growth of the plant? Describe the appearance of pine-apples which have been attacked by fungus diseases. Are there any differences in such appearances which would suggest to you that pine-apples may suffer from more than one disease? If so, what are these differences? What kind of soil is the best for pine-apples, and why is it that the drainage of that soil must be effective before the plants will thrive?

At this time, limes are ripening, and the gathering of the crop will continue until the end of the year. In order to facilitate the collection of the fruit, the weeds beneath the trees should be kept short with a cutlass, or by other suitable means. Care must be taken, especially at the time of heavy rains, to keep all drains open. These are the chief matters that admit of attention, until the harvesting of the crop is completed. A useful exercise will be provided by choosing a few trees, in different parts of a plantation, and making observations on the yields of these. Such observations will be given an additional value by the making of others, for the purpose of obtaining suggestions as to the causes of the variations which will certainly be found to occur. Make notes on the size of the fruits produced by trees in different places, and as before, account, if you can, for the variation. Where a tree has borne a heavy crop of limes, observe the effect on its subsequent state, especially as regards its general health. In relation to pests and diseases generally, take notice of the trees that are most prone to suffer from these, and try to supply a reason, or reasons, for the added susceptibility of them. Find out how long, under ordinary conditions, limes may remain on the ground without rotting, and ascertain which part of the fruit first shows signs of decay.

Where Bengal beans are grown over lime trees, make observations of the following kinds: (1) the effect on the growth of the trees; (2) the extent to which scale insects are present; (3) the amount of parasitism of these by fungi. How could you tell if the cover given by the Bengal beans was too thick? What possible effects may be produced by the Bengal beans (1) on the soil; (2) on the air in their vicinity? What relation has the use of Bengal beans in lime cultivations to the control of weeds?

The production of the Christmas crop of cacao is taking place at this time, and a commencement of picking will be made shortly. What precautions are of the greatest importance in gathering cacao pods, and why are these precautions necessary. What ill effects on the succeeding crop will probably be caused by careless picking, and how are these effects brought about? Constant attention is required in removing suckers from the trees. What conditions, in a plant, are the most general cause of the production of suckers, and why are the latter usually removed when they appear? As has been stated above, for limes, the drains in cacao plantations require special attention at this time of the year. Give an account of what is likely to happen (1) to the soil, (2) to the plants, where the drains in a plantation are allowed to become gradually filled up? Why are drains often employed, in cacao fields, on the sides of hills, even where the water can get away quickly, without any artificial aid?

On a cacao (or nutmeg) estate, some of the trees may show irregular dull-black patches, with a rough surface, on the bark. The patches measure at least an inch across, and may reach as much as 2 inches. They are the outward manifestation of a fungus that may eventually cause the death of the plants that have been attacked. Where this is possible, look carefully for any signs of the presence of such a fungus. What remedial measures might be suggested, in the presence of an outbreak of such a disease?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why are limes allowed to fall to the ground before they are gathered? What is the reason for not adopting this method for harvesting other citrus fruits?

(2) Why is it important, in the case of cultivated plants, to encourage the development of a large root system? State the ways in which this may be done.

(3) Why does farmyard manure disappear more quickly when it is buried in sandy soils than when it is treated in the same way in clay soils?

INTERMEDIATE QUESTIONS.

(1) What is the value of a good supply of humus in the soil? What are the chief sources of humus, and how is it best conserved?

(2) What treatment should lime trees receive after they have been weakened through an over-production of fruit?

(3) Describe a good method of curing and preparing ginger for shipment.

FINAL QUESTIONS.

(1) What bacteria, of importance to the agriculturist, are usually found in farmyard manure, and what is their action?

(2) Discuss the requirements of one important crop, in the West Indies, in relation to the provision of shade at any stage of its growth.

(3) Mention the chief pests of sugar-cane or cacao, and state what precautions should be taken against them. Give the approximate cost of any measures recommended to be employed against one of those you mention.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from British Guiana by the R.M.S. 'Berbice' on the 18th instant. As was stated in the last number of the *Agricultural News*, Dr. Watts's visit to British Guiana was made for the purpose of conferring with His Excellency the Governor, as well as with a Committee that had been appointed by him, with regard to the preliminary arrangements for holding the forthcoming Agricultural Conference in that colony.

FUNGUS NOTES.

THE DISINFECTION OF INDIAN CORN SEED.

The prevalence of root disease of Indian corn in Antigua and other islands, and the fact that isolated cases of smut of this plant are known to occur to some extent here and there every year, led to the idea that it might be advisable to recommend the disinfection of Indian corn seed before planting. The method to be employed is identical with that followed in the case of cotton seed. Experiments were therefore conducted in the laboratory of the Head Office, to ascertain if corrosive sublimate solution, in the proportion of 1 part in 1,000, had any harmful effect on the seeds.

For the first experiment, 600 seeds were counted out in lots of 100, and treated as follows:—

Lot I was immersed in corrosive sublimate solution, for forty minutes.

Lot II was immersed in the solution for twenty-five minutes.

Lot III was immersed in the solution for twenty minutes. Each lot of 100 seeds was then put into a separate germinating chamber, consisting of a cylindrical glass dish, with a cover fitting well over its sides, and containing four thicknesses of damp blotting paper. Three lots of 100 untreated seeds were put directly into damp chambers made up as described above. At the end of five days, the germination was as follows:—

	Treated seeds, per cent.	Untreated seeds, per cent.
Lot I	97	74
Lot II	99	73
Lot III	93	82

while at the end of thirteen days, the figures were:—

	Treated seeds, per cent.	Untreated seeds, per cent.
Lot I	98	81
Lot II	99	86
Lot III	98	87

At this point, the experiment was discontinued, as it showed clearly that not only did the corrosive sublimate solution have no harmful effect, but it appeared to assist germination and make it more regular. It was, further, very noticeable that the treated seeds remained clean, while those not treated were covered with moulds.

As the control seeds in the former experiment were not immersed in water before germination for a period equal to that for which the treated seeds were immersed in the solution, it is evident that the above results are not strictly comparable. Consequently a second experiment was undertaken, using corrosive sublimate solution of the same strength, the same number of seeds and the same apparatus. The seeds were divided into lots of 100, and treated as follows: Three lots were immersed separately in corrosive sublimate solution for twenty minutes, and three more in distilled water for the same time. They were then put up in the germinators, and as before, kept in the dark. At the end of two days, they had commenced to germinate, the numbers being:—

	Treated seeds, per cent.	Untreated seeds, per cent.
Lot I	82	52
Lot II	76	27
Lot III	70	38

Three days later the figures were as follows:—

	Treated seeds, per cent.	Untreated seeds, per cent.
Lot I	99	83
Lot II	98	60
Lot III	99	69

As might well be expected from the above figures, the treated seeds showed no further germination after these first five days, but the untreated ones continued to germinate, a few at a time, during the next eighteen days, the total period of germination being twenty-three days. The final figures were:—

	Untreated seeds, per cent.
Lot I	98
Lot II	96
Lot III	96

These figures show that not only does the treatment ensure the germination of a higher percentage of seed, and possibly reduce the chance of infection by certain fungoid diseases, but also, that it acts as a direct stimulus to germination, so that a more even, as well as a more regular, stand would result from using treated seed, since all the seed germinates at the same time.

Mr. C. J. Simmons, of St. Vincent, informed this Department a short time ago of the fact that treatment of Indian corn seed in this way is practised on several estates in that island, with most satisfactory results. This method has supplanted the older one of immersing the seed in salt water. The seed is planted while wet, and the somewhat difficult operation of drying is thus avoided. It is recommended that the practice be adopted in other islands, as it is almost certain to prove a decided benefit to the resulting crop.

THE FROG-HOPPER FUNGUS IN TRINIDAD.

In the present number of the *Agricultural News*, some account is given of the frog-hopper insect, under the heading of Insect Notes. As considerable damage is inflicted on the sugar-cane in Trinidad, owing to the attacks of this pest, the attention of the Entomologist, Mr. F. W. Urich, and of the Mycologist, Mr. J. B. Rorer, is at present directed to the discovery of the best means of controlling its increase. It is mentioned that a fungus is found to occur very frequently on dead specimens of both the adult and the nymphal stages of the insect. This fungus has been known in Trinidad for some time, but it is only very recently that systematic investigation of its life-history, and of its actual parasitism, has been undertaken. In a recent publication of the Board of Agriculture, entitled 'The Frog-hopper Fungus', a short account is given by Rorer of the results so far obtained in these investigations. It is from this paper that the information reproduced here has been taken.

There is at present considerable doubt as to the identity of the fungus. Hart and Collens first stated that it was a member of the genus Entomophthora, which contains many entomogenous species; but at a later date, specimens sent to the United States Department of Agriculture were identified as *Oospora destructor*, and *Penicillium anisotliae*. (*Agricultural News*, Vol. VIII, p. 204.) In 1908, specimens were sent to Kew, and Massee in the *Kew Bulletin*, 1910, p. 4, described the fungus as a new species—*Septocylindrium suspectum*. Rorer states that the fungus in Trinidad is not a Septocylindrium, and that probably that described by Massee developed as a saprophyte while the specimens were in transit. As far as can be determined at present, the parasite belongs to the Oospora

type, no other spore form having as yet been obtained. The spores are 0·00012-inch long, by 0·00004-inch in diameter, and cylindrical in shape. They are produced very rapidly in long chains, and are olive-green in the mass, the number formed on a single insect being extremely great.

Various laboratory experiments, conducted with a view to infecting healthy insects, have all proved successful, while the control insects have not been affected, so that it has been shown definitely that the fungus is an active parasite. Furthermore, 100 stools of cane, badly attacked by frog-hoppers, were infected with spores of the fungus from a pure culture, with the result that, five days later, large numbers of the insects were dead, and showed the fungus all over their bodies. As a result of these experiments, Rorer is of the opinion that the possibility of using this fungus for controlling the insects is considerable, and attempts to obtain as large quantities of it, in as pure culture as the apparatus available will allow, are now being instituted in Trinidad, with a view to starting field experiments on its employment for this purpose, on a large scale. The results of these trials, and of Rorer's investigations into the life-history of the fungus, will be awaited with interest, and should prove valuable not only in Trinidad, but in all those countries where the frog-hopper is known to exist.

AGRICULTURE IN THE CAYMAN ISLANDS.

Though the soil is shallow, and in many districts the rocks protrude, the land, generally speaking, is well adopted to agricultural pursuits, and in former days was made to yield much more than at present.

The Grand Cayman Branch of the Jamaica Agricultural Society (founded in 1908) has done much to forward agricultural pursuits on more modern principles, with good results.

Guinea grass on shallow ground, and Parnassia grass on swampy land, are the principal crops of the island of Grand Cayman. It is impossible to state how many acres are devoted to these crops, but not less than 4,000. In some districts, eschalots, pumpkins, corn, (Guinea corn and maize), sweet potatos, yams, cassava, bananas, plantains, tomatos, and other tropical vegetables, are largely cultivated. Mangos, avocado pears, oranges, and other fruits grow wild, little or no attention being paid to their cultivation. If there were any possibility of export to the Southern States, fruit would undoubtedly be cultivated; but as there is no steamship communication this is not possible.

Almost every householder has his own lot of land, which he either allows to grow up in bush, or cultivates for his own domestic supply, or the raising of cattle and horses. There being no land tax, an owner can either allow his land to run to waste, or cultivate it as and when he chooses. Many owners refuse to work their land themselves, or sell, rent, or lease it. The result is, there are many thousands of acres of land lying idle.

The following return shows the number of cattle, etc. on the Island of Grand Cayman at the end of the year 1909: cattle 1,619, mules 17, horses 293, asses 47.

Pigs and goats, not being taxable, no accurate return can be given, but it is probable there are over 400 pigs and 150 goats. At one time, sheep were largely bred in the new lands and West Bay districts, and exported abroad, but there are no sheep on the island at this date.

The Island of Grand Cayman could with ease support ten times the stock now in existence if it were all cultivated.

Beef sells in the market at $4\frac{1}{2}d.$ per lb., and mutton and pork at 6*d.* per lb.

In the Lesser Cayman there is little agricultural interest, principally because the land is unsuitable for the cultivation of ordinary products. In Cayman Brac, a small area is devoted to the cultivation of Guinea grass for the raising of cattle (about 100) and horses (about 20). Sufficient yams and cassava are also grown to meet the local demand and admit of a small export to Grand Cayman. The rest of the island of Cayman Brac, and the whole of the island of Little Cayman, are devoted to cocoa-nut culture. The cocoa-nuts are exported, and fetched in 1909, £4 a thousand. The actual crop varies little from year to year (about 2,000,000) though prices vary. In a dry season the cocoa-nuts are small and do not fetch the full prices. There is an export duty of 1*s.* per thousand.

Formerly, cocoa-nuts were largely grown in Grand Cayman, but a disease attacking the trees, they practically all died, and at this date they are probably not more than 2,000 cocoa-nut trees on the island. The disease spread, and continued, through the general apathy of the population to stop it.

Sisal grows wild throughout the Dependency, but no attempt to turn it to use was made until two years ago, when a few small plantations in Grand Cayman were laid out. A sample of fibre produced from plants growing wild, and hand cleaned, was submitted for report, and estimated at the value of $6\frac{1}{2}c.$ per lb. The industry, if taken up by the people, would prove profitable, as it is easily grown and will thrive on waste land.

Such vegetables as cabbages, turnips, carrots, cucumbers, lettuces, and radishes grow easily, especially in the winter months.

Previous to 1838 (the days of slavery), and for a few years afterwards, many useful and valuable products were obtained from the land, such as ground nuts and ginger. An effort is being made to re-establish the cultivation of the ground nut, and ginger will probably follow. (*Colonial Reports*—Miscellaneous, No. 73.)

CACAO IN ECUADOR.

It is shown, in *Diplomatic and Consular Reports*, No. 1560 Annual Series, that the amount of cacao exported from that Republic in 1909 was 70,287,004 lb., of a value of £1,757,175. This was nearly equal to the quantity exported in 1908; it was smaller on account of the failure of the crop in certain districts. As cacao is the principal export of Ecuador, the lower prices that were obtained in 1909 are a matter of special concern. The lessening of the value of this product in the market has arisen from the smaller crops that were obtained, in 1907, in several parts of the world. The consequent rise in prices caused the demand to be lowered, and although these have naturally fallen, subsequently, they have not yet acted in the direction of reviving the demand. These circumstances are assisted by the existence of stocks in Europe and the United States, which originated in the large crops that were obtained in 1908 and 1909. The experience of Ecuador is naturally that of all other cacao-producing countries.

In the report to which reference is made, it is stated that a new company has been formed, in London, for the purpose of developing the Tenguel cacao and rubber estate, which is said to be of vast extent and capability, and that other large investments of British capital will be made shortly.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR October 11, 1910; Messrs. E. A. DE PASS & Co., September 16, 1910.

ARROWROOT—St. Vincent, $1\frac{15}{16}$*d.* to $3\frac{3}{4}$*d.*
BALATA—Sheet, 3/5; block, 2/5 per lb.
BEESWAX—£7 10*s*
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 50/- to 55/6; Jamaica, 48/6 to 52/6.
COFFEE—Jamaica, 42/- to 92/-.
COPRA—West Indian, £27 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 24*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 49/- to 51/- per cwt.; low middling to middling, 54/- to 57/-; good bright to fine, 58/- to 65/-.
HONEY—24/- to 25/-
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/2; concentrated, £18 2*s.* 6*d.* to £18 5*s.*; Otto of limes (hand pressed), 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{8}$*d.*; fair, $2\frac{1}{4}$*d.*; good, $2\frac{3}{8}$*d.* per lb.
RUBBER—Para, fine hard, 7/-, fine soft, 6/4; fine Peru, 6/9 per lb.
RUM—Jamaica, 1/7 to 4/6.
SUGAR—Crystals, 15/9 to 19/-; Muscovado, 12/- to 14/6; Syrup, 10/- to 15/$1\frac{1}{2}$; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., September 30, 1910.

CACAO—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, $11\frac{1}{4}$c. to $11\frac{1}{2}$c.; Trinidad, $11\frac{1}{2}$c. to $11\frac{3}{4}$c.; Jamaica, 9c. to 10c. per lb.
COCOA-NUTS—Jamaica, select, \$37·00 to \$38·00; culls, \$22·00 to \$23·00; Trinidad, select, \$37·00 to \$38·00; culls, \$22·00 to \$23·00 per M.
COFFEE—Jamaica, ordinary, 11c.; good ordinary, $11\frac{1}{4}$c.; and washed, up to 13c. per lb.
GINGER—$8\frac{3}{4}$c. to 12c. per lb.
GOAT SKINS—Jamaica, 56c.; Barbados, 50c. to 52c.; St. Thomas, St. Croix, St. Kitts, 46c. to 47c. per lb.; Antigua, 50c. to 52c., dry flint.
GRAPE FRUIT—\$4·75 to \$5·50 per box.
LIMES—\$5·00 to \$6·00.
MACE—37c. to 42c. per lb.
NUTMEGS—110's, $8\frac{1}{2}$c. per lb.
ORANGES—Jamaica, \$2·25 to \$2·50 per box.
PIMENTO—4c. to $4\frac{1}{8}$c. per lb.
SUGAR—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., October 15 1910.

CACAO—Venezuelan, \$11·75 per fanega; Trinidad, \$11·50 to \$11·75.
COCOA-NUT OIL—\$1·08 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—\$5·20 per 100 lb.
DHAL—\$3·80.
ONIONS—\$3·25 per 100 lb.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$1 80 to \$1·90 per 100 lb.
RICE—Yellow, \$4·40 to \$4·50; White, \$4·80 to \$4·90 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., October 21, 1910; Messrs. T. S. GARRAWAY & Co., October 24, 1910; Messrs. JAMES A. LYNCH & Co., October 17, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$21·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$12·50 per 100 lb., scarce.
HAY—\$1·20 per 100 lb., dull.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·20 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·40 per bag of 210 lb.; Canada, \$3·45 to \$3·60 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·40 to \$3·00 per 160 lb.
RICE—Ballam, \$4·90; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, October 15, 1910; Messrs. SANDBACH, PARKER & Co., October 14, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·25 per 200 lb., wanted	\$8·25
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE Creole	14c per lb.	12c. to 13c. per lb.
Jamaica and Rio	15c. per lb.	15c. per lb.
Liberian	$8\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$3·65 to \$3·70 per bag of 168 lb.	\$3·70 per bag of 168 lb.
Green Dhal	\$4·25	——
EDDOS—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		—
Madeira	$2\frac{3}{4}$c. to 3c.	$2\frac{3}{4}$c.
PEAS—Split	\$6·00 per bag (210 lb.)	\$5·75 to \$6·00 per bag (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	\$2 50	\$2·50
Lisbon	——	No quotation
POTATOS-Sweet, Barbados	\$1·20 per bag	——
RICE—Ballam	\$4·80 to \$4·90 per 175 lb.	\$4·80 to \$4·90
Creole	\$5 00 to \$5·10	\$5·00 to \$5·10
TANNIAS—	\$2·16 per bag	——
YAMS—White	\$2·88	——
Buck	\$3·12	——
SUGAR—Dark crystals	\$2·65 to \$2·70	None
Yellow	\$3·25	\$3·70
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·25	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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CONTENTS.

The Centralization of Agricultural Research.

AGRICULTURE, in the modern sense of the term, is a many-sided subject, and requires for its successful advancement the work of many men who have been trained, not only in different branches of natural science, but also along very different lines. The two extreme types of men interested in the advancement of this most important branch of human knowledge are represented by the practical planter on the one hand, and the academical scientist on the other. Midway between these stands the man entrusted with the care of field experiments, who must be possessed not only of a general knowledge of the nature and value of the different branches of scientific investigation, but also of the methods and conditions of practical agriculture as exhibited in the district to which his work is intended to be of service.

Now it is part of the nature of scientific research that the general conclusions at which it arrives are, in many cases, applicable to practical methods over a very large area, when once they have been modified to suit local conditions. Consequently, the number of individuals required to investigate the scientific side of any problem is relatively small, while the number of practical workers to whom they may be of value is large. The channel by means of which the results obtained in the laboratory are usually conveyed to the practical workers in any agricultural district is through the man entrusted with the conduct of field experiments. The number of these men must depend either on geographical conditions or on the extent to which land is under cultivation.

The functions of the middle man referred to above are threefold. In the first place, he must test the value of laboratory results as applied to the production of crops under local conditions; though the lines along which these tests should be made must be indicated by the scientific investigator who interprets the results. In the second place, he is required to give advice when needed to the practical worker, in the light of the knowledge acquired from the tests conducted, so that the information obtained may be thoroughly disseminated. Lastly, he may from his experience of local problems suggest lines of investigation, which would be of value,

to be conducted by the appropriate members of the laboratory staff.

The body of academical scientists is generally composed of men who have been trained in one of four special aspects of natural science. They may be concerned with the determination of the composition and properties of substances employed in agriculture (Agricultural Chemistry): with the study of plants of economic importance (Botany); with the investigation of the damage inflicted on crops by animals, particularly insects (Entomology); or in studying the ways to prevent the loss due to the lower forms of plant life (Mycology). The problems which they investigate are suggested in the course of their work, by a study of the current literature of their subject, or by consideration of the suggestions received from those in change of field experiments in a large number of different districts. In the case of the Entomologists and Mycologists, scientific investigations may also be necessitated by the occurrence of an epidemic attack of some insect pest or fungoid disease. It should, however, be understood that it is not necessary for such workers to possess, as part of their equipment, a detailed knowledge of the conditions of agricultural practice in any special district; what they need is to be accurately informed of those conditions, in the places where their advice is required, in order that they may be enabled to recommend the adoption of the measures that are most suited to those conditions It is here that those who are in charge of experiment stations possess a particular usefulness in giving the specialist an accurate idea of the circumstances in which his knowledge may be applied. This knowledge is general. It only requires to be adapted in such a way as to apply to the problem which is causing uneasiness to those who are engaged in agricultural pursuits for the purpose of making a living.

It is part of the function of the laboratory staff to keep itself thoroughly in touch with all the current literature relating to the subject of scientific agriculture, as well as to conduct research. This literature must be correlated and disseminated, through the medium of definite publications, in a form in which it is of most service to the practical man. Besides rendering available all the latest results of investigations made in other parts of the world, the body of scientific investigators must prepare more technical articles setting forth for the benefit of other similar bodies the results of its own researches.

The value of co-operative effort between the various types of men concerned with agricultural interests is well illustrated by the working of such departments as those in India and the United States. Institutions of this nature are, broadly speaking, modelled on the lines already indicated. The scientific staff is subdivided into groups of men concerned with the investigation of problems connected with one branch of science, only. Their results are conveyed through middle men and thus become available to the farmer. It is clear that when such a department requires to enlarge the sphere of its activities to include a new area, it can do so to the best advantage, not by increasing the personnel of its scientific staff, but by adding to the numbers of the middle men in its employ. A body of specialists whose work is intended to elucidate problems connected with agriculture in India has recently been assembled at the Agricultural Research Institute at Pusa. The results obtained by them are published, and so made available to the various provincial departments and planters' associations, and the scientific officers of these institutions direct the application of the results to the conditions of cultivation which exist in their districts. All such organizations are intended to direct and economise the energy spent on scientific investigation, in order that the most satisfactory results may be obtained for the minimum expenditure of labour, money and time.

RUBBER-TAPPING EXPERIMENTS IN CEYLON.

In the *Tropical Agriculturist* for August 1910, p. 98, a review is given, by Mr. T. Petch, of experiments that are being made, in tapping Hevea trees, at Henaratgoda, Ceylon. The purpose of this review was to determine how far former interpretations of the results were justified.

It will be well to give the chief conclusions reached by Mr. Petch, in view of their value, as far as they go. These relate to (1) the yield of rubber from different parts of the stem; (2) the relative value of different methods of tapping; and (3) the yield obtainable by tapping at different intervals.

In regard to the first, it is stated that, as the experiment stands, it appears to prove that the greatest yield is obtained by tapping at one-quarter the height of the tree from the base. The result is interesting, but not final in character, as it is vitiated by certain circumstances in the experiment, and by abnormal yields in particular instances.

The trials for determining the relative value of different methods made it appear that, where trees are being purposely injured by tapping, in order to thin them out, herring bone tapping on *both* sides of the tree is better than the employment of the full spiral.

In relation to the third matter, the final figures would appear to show that tapping on alternate days yields more latex than tapping every day; but an analysis of the results shows that this conclusion, at any rate, is untenable.

SUGAR INDUSTRY.

EXPERIMENTS IN DRYING MEGASS.

The *Modern Sugar Planter*, for August 27, 1910, states that Professor E. W. Kerr, of the Engineering Department of the Louisiana State University, who has made an exhaustive study of the burning of megass in sugar factories in Louisiana and Cuba, intends to effect an extension of his research work in connexion with this subject. This extension is in the direction of the conduct of experiments in drying megass, for the purpose of determining if this adds to its fuel efficiency. Another object of the work is to find a means of dispensing with the oil fuel that is used in conjunction with megass, for burning, in many sugar factories in the United States.

In the experiments, the plan will be to make use of the waste heat that passes up the chimney with the furnace gases, for the purpose of drying the megass. The publication to which reference has just been made states that the drier will consist of a metal chamber, 19 or 20 feet in height and 5 feet square. This will be provided with a hopper, through which the megass will pass in a continuous stream into the drier. As it enters the chamber, the megass will fall on tilting shelves, some of which will have a shaker motion imparted to them. The shelves will be at suitable distances, and the hot air will pass over them, and through perforations in them, thus drying the megass. After this has fallen through the chamber from shelf to shelf, it will pass through a hopper at the bottom and be carried to the furnaces in the ordinary way.

The method of introducing the heat into the drier will be to drive the waste gases from the furnaces into it by means of an exhaust fan. The gases will be taken up as they pass from the furnaces into the chimney.

It is stated, finally, in the article that Professor Kerr expects that at least 25 per cent. of the moisture contained in the megass, as it leaves the mill, will be removed by the drying process. The opinion is given that, if this percentage of drying is obtained, the process will be found highly economical for every sugar factory in Louisiana. It should be especially adapted to conditions of sugar manufacture of the kind which obtains in that State, where the mill feeds are high, and a large proportion of water is used in maceration.

THE ANALYSIS OF MEGASS.

The following interesting conclusions in regard to the analysis of bagasse (or megass) have been reached after work at the Experiment Station of the Hawaiian Sugar Planters' Association, which is described in Bulletin No. 32 of that station, entitled *Bagasse Analysis—Determination of Sugar and Moisture.*

It may be added that in the bulletin, a new method, by which a larger polariscope reading is obtained, is described, thus giving a means of reducing the errors from this source. Methods, based on the results of the investigation, are also suggested for sampling and for the determination of sugar and moisture in megass:—

1. The careful sampling is of more importance than any other part of the process of the analysis of bagasse.
2. No entirely satisfactory method of preserving bagasse has been found: it had therefore best be analyzed soon after it has been collected.
3. The bagasse sample loses considerable moisture during the chopping, which should be taken account of in weighing samples for analysis.
4. In determining the polarization of bagasse by digestion in water, the digestion should be continued for an hour to insure a homogeneous diffusion of the solution through the bagasse.
5. No other dextro-rotatory substance than sugar is extracted or produced from bagasse from Hawaiian cane by boiling with water.
6. Bagasse cannot be sampled or analyzed accurately unless finely divided.
7. Two cubic centimetres of a 5-per cent. solution of sodium carbonate to 50 grams of bagasse was found to be the most convenient reagent to use in the water for digestion.
8. In digesting bagasse in water the solution should be mixed occassionaily to insure a homogeneous diffiusion.
9. No water should be added to the solution after digestion.
10. The same results are obtained by water digestion for one hour, and by extraction with alcohol or water for one and a half to two hours.
11. Bagasse samples dry very much more quickly when spread out in a thin layer than in thick masses. A 3-inch layer of bagasse cannot be depended upon to have lost all its moisture in seven hours at 100°-105°C.
12. Bagasse can be dried safely at 125°C. in three hours.
13. Some samples of bagasse do not lose all their moisture, when dried in a vacuum at 100°C., in less than three hours.

An Enemy of 'Millions'.—Some time ago, several specimens of an insect predaceous on millions were forwarded to the Head Office by Mr. G. F. Branch, Agricultural Instructor, Grenada, who explained that he had observed these insects attacking the fish, and eating them.

In the absence of Mr. H. A. Ballou, M.Sc., the Entomologist to the Department, the insects were sent to the Rev. N. B. Watson, Vicar of St. Martin's, Barbados, with a request that he would report anything of interest that he knew concerning them. Mr. Watson has kindly examined the specimens, and states that they are the larvae of a beetle belonging to the family Hydrophilidae, the larval stage of which is active, predaceous and carnivorous, preying on all kinds of small aquatic animals, including young millions. It is suggested by Mr. Watson that this is only likely to become an enemy of millions where food is scarce, and that it may be removed from water, where the fish are being raised, by dredging it out with a shallow net sieve, and taking the larvae out from among the millions by means of a pair of forceps, while the sieve is just under the surface of the water.

It may be stated that mention of enemies of millions found in St. Lucia by Dr. L. Nicholls was made in the *Agricultural News*, Vol. IX, p. 315.

FRUITS AND FRUIT TREES.

SUCCESSFUL USE OF FLORIDA BUDWOOD IN THE WEST INDIES.

A communication has been received from Mr. J. Jones, Curator of the Botanic Station, Dominica, which gives interesting particulars as to the success which has been obtained at that station in budding superior varieties of grape-fruit on sour orange stocks.

The budwood was received from Messrs. Reasoner Bros., Florida, at the beginning of last June. On its arrival, it was employed for the purpose of budding, in the way mentioned. The following table shows the amount of success that was obtained in this:-

	Buds inserted.	Buds which grew.	Percentage.
Marsh's seedless	49	24	49
Mannville's improved	31	2	6
Pernambuco	47	21	44
Royal	9	1	11
Tresca	19	8	42

The results show that plants of all the varieties that were imported were secured. As Mr. Jones points out, they are good, considering that three weeks elapsed between the time that the budwood left Florida and the time at which it was worked on to the stocks, in Dominica.

The communication goes on to state that, from a few of the more advanced plants, budwood is already being taken for propagation, and that considerable supplies of budding material should be available, from the plants raised, for distribution early in next year. It is suggested that, where such material will be required by Botanic Stations, preparations should be made now, for the reception of the budwood, by the provision of a number of sour orange stocks on which it is to be employed.

It is pointed out, further, that the best method of importing new varieties of citrus fruits into the West Indies for propagation is by means of budwood. When the buds are worked on sour orange stocks of the local kind, better plants are obtained than when stocks already budded are imported. This is due to the fact that the conditions under which the stocks grow, in Florida, are very different from those which obtain in the West Indies.

A USEFUL VARIETY OF SORREL.

The *Yearbook* of the United Sates Department of Agriculture, for 1909, describes a new variety of red sorrel (*Hibiscus Sabdariffa*), the account of which is reproduced below. Recent information concerning the sorrel (or roselle) has been given in the *Agricultural News*, Vols. VII, p. 244, and VIII, p. 388:—

The roselle, *Hibiscus Sabdariffa*, Linn., though native to the Old World Tropics, has long been sparingly introduced to the West Indies and elsewhere in tropical America. It was reported in Jamaica as early as 1707 by Hans Sloane, who stated that it was planted in most gardens of that island, where, 'The capsular leaves are made use of for making Tarts, Gellies, and Wine, to be used in fevers and hot distempers, to allay heat and quench thirst.' In Florida, where the date of its introduction, though unrecorded, is evidently recent, it is very commonly known as 'Jamaica Sorrel', and in parts of tropical America, notably the Canal Zone, it bears this name, indicating the Jamaican channel through which the species was probably distributed in the New World. Notwithstanding its long recognition as a valuable plant in both the Old and the New Worlds, little attention appears to have been paid to the development of improved strains until recently. In fact, so far as known, the Victor is the first variety or race to be dignified with a varietal name. This is probably due to the fact that in India, as has been stated by Wester, the species, though recognized as possessing edible qualities, has chiefly been grown as a fibre plant rather than for its edible calices, the portion prized in the American tropics. As the plant is a tropical annual, requiring at least six months of warm weather free from frost to bring it up to the beginning of its harvest period, and about two months more to mature its full crop, its chief interest to American planters will be in southern Florida and frost-free localities in California, together with Porto Rico, the Canal Zone, Hawaii and the Philippines. Its luxuriant growth and great productiveness may render it sufficiently profitable in some sections, where frost occurs too early to permit its seed to ripen, however. It appears not improbable that earlier maturing varieties may yet be developed which may be adapted to a considerable portion of the cotton states.

The Victor was originated at Miami, Florida, by Mr. P. J. Wester, Special Agent in the Bureau of Plant Industry. Having obtained a few plants of the common roselle in 1904

from Mr. W. A. H. Hobbs, of Cocoa-nut Grove, for planting in the Subtropical Garden at Miami, Mr. Wester observed marked variation among them and began selecting seed from those bearing the largest calices and showing other desirable characteristics, with the result that in the second generation of plants (1906), the strain was considered fixed, and has so continued.

DESCRIPTION. Mr. Wester's characterization of the Victor is as follows. The plants of the Victor variety are inclined to be a trifle more dwarf than the common kind, but the foliage is similar. The measurements of the calyx of the common variety are: length 33 mm., diameter 22 mm.; in the improved type the measurements are 49 mm., and 28 mm., respectively. The increase in size is thus seen to be rather more in length than in diameter. Calices of the improved type have in some instances been 60 mm. long, and 38 mm., in diameter. The improved type is also distinct in being more strongly ribbed longitudinally, and in having the calyx not so closely adpressed to to the seed pod as in the common variety. It is frequently inclined to be convolute at the apex.

As a tropical plant yielding a quick return in the form of a sauce, jam, and jelly-producing fruit, closely resembling in quality the cranberry of the North, the Victor is worthy of testing wherever the common roselle has been found to succeed. To obtain the higest yield of large calices, the seeds are planted in southern Florida about May 15. The young seedlings are transplanted to the field when 3 or 4 inches high, and begin blossoming late in October. The first fruit is gathered about the middle of November, and should be harvested as rapidly as it reaches suitable size, in order to ensure continuance of blossoming and fruiting until late in February.

THE INTERNATIONAL RUBBER EXHIBITION, 1911.

The Exhibition has received official recognition at the hands of all the British Government's colonies, and of all foreign nationalities in which rubber is grown or manufactured. Germany has appointed an influential, official commission, and Holland has done likewise. The names of the special commissions for Belgium and France will shortly be published. The manufacturers of these countries are all exhibiting largely, while exhibits of crude rubber will be sent from their colonies. The largest exhibitor of crude rubber will be Brazil, and that Government proposes to appoint a special commission. The Brazilian space occupies some 8,000 square feet in the Exhibition, and Germany and her colonies will be next with about 6,000 square feet. The Netherlands and their colonies will occupy about 5,000 square feet. Ceylon and the Malay States have booked up some 3,000 feet, while the Gold Coast, Southern India, British West Indies, Uganda, and British East Africa are all well to the fore.

Rubber will be exhibited from such distant places as New Guinea, Queensland, Portuguese East Africa, the Sandwich Islands, etc. The largest piece of crude rubber—about 1 ton in weight—comes from Para, Brazil.

The Colonial Office has sent out invitations to all colonies inviting delegates to take part in the International Conference of producers and manufacturers, and replies have been received that most of the countries will be represented by delegates.

A large number of the rubber companies also are exhibiting separately, and no doubt when the Exhibition is open it will be found that the leading producers are individually represented, apart from the Government exhibits. In the Manufacturers' Section, several of the largest manufacturers of Great Britain and the Continent have booked spaces, and some of them of considerable dimensions, and there will be no reason to complain on this occasion that it is a crude rubber exhibition only. Rubber machinery will also have a very important place, some of the exhibits covering an area of 2,000 square feet. During the Exhibition, it is proposed to have an international dinner instead of a series of dinners as at the Exhibition of 1908. A meeting will shortly be called at the London Chamber of Commerce to arrange all details in connexion with the conferences and other functions.

His Majesty the King has intimated that he looks forward with pleasure to visiting the Exhibition. (The *India-Rubber Journal*, October 3, 1910.)

MATERIAL FOR PLANTING IRISH POTATOS.

On the quality of the sets planted much of the success of the potato crop depends. When selecting seed, the utmost care should be taken to see that the variety is true to type, and perfectly free from disease. Always make it a point to obtain seed from a reputable seed merchant or some reliable grower. For main crops, one or two varieties of sorts that have been tested and are known to do well in the particular district on similar soil should be selected.

In the size of the sets planted the practice of different farmers varies widely, some advocating the use of the whole tubers, others claiming equally good, and better, results from cut sets. The danger of partial or entire failure, resulting from an imperfect stand, is much greater with small sets, cut or whole, than with large ones. The small sets are liable to perish, should the season be unfavourable, either through excessive moisture or drought. A number of investigators have noted that large seed pieces—either large cut sets or whole potatos—afford an earlier crop than very small cuttings, and also produce an increased yield. Experiments carried out in the United States showed that whole tubers 2 to 3 inches in diameter yield more than small whole tubers $\frac{3}{4}$-inch to $1\frac{1}{4}$ inches in diameter, and large cut tubers 15 per cent. more than small cut tubers. The most economical set to use is one with two or three eyes and a good amount of flesh, and weighing about 2 to 3 oz. In cutting the sets, medium-sized tubers should be selected, and cut lengthways and then across. Many growers cut the tubers into sets containing one, two, or three eyes, laying greater stress on the number of eyes than the size of the set; but it is pointed out that, before the shoot develops its root system, it is dependent on the material stored up in the set, hence the more abundant this supply is, the more vigorous the growth of the plant. It is lamentable to see many farmers retaining and planting, year after year, the small and frequently much-diseased tubers that are unsaleable. This practice is not to be commended. A change of seed, not necessarily of variety, is of the highest importance, and should be made at least every three years. For preference, the seed should be obtained from a cooler climate. Many ideas prevail as to the relative values of different parts of the tuber for seed. Some advocate the removal of the stem end, but experiments have shown that there is no material difference noticeable in the yield that could be attributed to the different sets, and that the two ends of the tuber are of equal value. (*Farmers' Bulletin* No. 27, of the New South Wales Department of Agriculture.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 24, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, only about 100 bales of West Indian Stained Sea Islands have been sold: the stock now is practically all sold.

Owing to a storm on the Florida and Georgia coast, there has been a fear that the American Sea Island crop may have been damaged in quality, with the result that prices of the best Floridas have risen from 16½*d.* (at which the market opened) to 18*d.*, this being the price now ruling; but should the reported damage not be corroborated, prices may probably ease. 'Fully Fine' Carolina Island is offered at 19½*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 15, is as follows:—

The receipts for the week were 259 bales, against 600 bales last year, and total to date 351 bales, as against 925 bales last year, confirming the lateness of the crop.

The market opened this week, and all offerings were readily taken at the asking prices, viz.: Extra Fine 37c., Fully Fine 35c., Fine 33c.

Although the exchange reports only 300 bales, the actual sales were 500 bales. The buying, we think, was chiefly on speculation, the purchasers being influenced by the advancing market in Savannah.

The Factors are refusing to sell further until the above sales are filled, and they have some accumulation of stock; and unless the market is absolutely quiet for a week or two, they will ask higher prices.

THE BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the British Cotton Growing Association is taken from the *Monthly Magazine* of the Liverpool Chamber of Commerce for September 1910:—

The Seventy-ninth Meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, September 6. In the absence of the Earl of Derby, G.C.V.O. (President), Mr. John E. Newton occupied the chair.

WEST AFRICA. The purchases of cotton in Lagos for the month of August were 241 bales, as compared with 323 bales for August last year, and 137 bales for 1908. The purchases since the beginning of the year amount to 5,469 bales, against 11,489 bales for the same period of last year, and 5,400 bales for the whole of 1908. The prospects for cotton-growing during the present season are all that can be desired, and about 400 tons of cotton seed have already been given out by the Association, most of which has been distributed through the Government Agricultural Department to native farmers. Large supplies of seed have also been distributed to native cultivators in Northern and Southern Nigeria.

UGANDA. The purchases of cotton in this Protectorate continue to be most satisfactory, and at the present time the Association have nearly 3,000 bales either in Liverpool or in transit. The prospects for the new crop are most favourable, and it is expected that picking will commence towards the end of October. During the month of August the Association received 1,415 bales of cotton from East Africa.

NYASALAND. The machinery and buildings for the ginnery at Port Herald have been despatched, and every effort is being made to have the ginnery ready for this year's crop, which begins to come in about this time. The reports received both from the Government officials and also from the Association's representatives with regard to the crop are most encouraging, and in one district alone, which is situated near Lake Nyanza, the Association have purchased over 100 tons of seed-cotton grown by the natives.

Considerable satisfaction was expressed that arrangements have now been made with the Union Castle Line for a direct service of steamers to East Africa through the Suez Canal. This will greatly benefit the cotton industry in East Africa and Nyasaland, as the cotton will now reach Liverpool several weeks earlier than was formerly the case.

RHODESIA. The Council of the Association have now approved of the arrangements for the development of cotton-growing in Rhodesia, in conjunction with the British South Africa Company. Several months ago Mr. Bateson, one of the Association's most experienced agriculturists, who has been in charge of the experimental plantation in Lagos for some years, was sent to Rhodesia to report upon the suitabilty of the soil and climate from a cotton-growing point of view. Mr. Bateson made a careful study of the conditions in Northern Rhodesia, and was greatly assisted in his work by the officials of the British South Africa Company. He reported that there were many large districts along the railway between Livingstone and Broken Hill, where the conditions were favourable for cotton-growing. There are a number of white planters, who, with few exceptions, have not been very successful, mainly owing to the lack of expert assistance. In some cases the land has been badly selected, and attempts have been made to grow cotton on sandy and unsuitable soil, and in others the land has been wrongly tilled. In order that planters may receive the neces-

sary advice and assistance, it has been decided:—

(1) To send out an expert, whose advice will be available for all farmers in the district.

(2) To open an experimental farm for testing different varieties of cotton, rotation of crops, fertilizers, etc., which would also be a training farm for both Europeans and natives.

(3) To establish a ginnery with an efficient hydraulic press, available for all farmers in the district.

It is proposed to commence work with a plantation of about 200 acres for the first season, which could afterwards be extended, and by the close of the second season sufficient data should have been acquired to prove whether cotton cultivation can be made a commercial success.

The cotton produced in Rhodesia is of a very desirable quality, and has generally realized about $2d.$ per lb. upon the price of middling American. It has hardly been possible, as yet, to form a reliable opinion as to the cost of production, which can only be arrived at by taking the average yield per acre over a number of years.

COTTON IN NYASALAND.

The *Annual Report on the Agricultural and Forestry Department*, Nyasaland Protectorate, for 1909-10, gives the following information as to the state of the cotton industry during that time:—

The cotton industry of Nyasaland is divided into two sections: (1) The European industry; (2) The native industry.

European acreage has increased from 6,037 last year to 8,975 for the year under review, and the crop at present being harvested covers over 12,000 acres. It will be seen from the above figures that solid progress is being made, and I am happy to report that the quality leaves nothing to be desired. Nyasaland has obtained the record price of 1*s.* 2½*d.* per lb. for Nyasaland upland. The brokers, reporting on the upland crop of 1909, consider it to be the finest cotton ever grown from upland seed, either in America or elsewhere. Nyasaland upland is now thoroughly acclimatized, and doing very well at different levels, from 1,000 to 3,000 feet, which is a remarkably wide range for a single variety. On the lower levels the growing season is longer, and the yield generally heavier, but the quality is inferior to highland grown, being less silky.

Lustre, silkiness and length of staple seem to be inherent characters of the highland soils, and all classes of cotton rapidly acquire these characters, after being grown for a few years in the country. A most gratifying feature is the increasing yield per acre, and several estates which produced 100 lb. of lint a few years ago are now averaging as high as 165 lb., some gardens yielding over 2 cwt. per acre.

The European Egyptian crop of the Lower River was a partial failure, due to the ravages of bacterial blight, an American disease, which has been the cause of considerable loss for several years. During last season I conducted careful investigations (Bulletin No. 2 of 1910) regarding this disease on River-grown Egyptian, and arrived at the following conclusions:—

1. The disease is most severe in low-lying portions of estates at or below the level of high river.

2. From wet lands it spreads to better drained soils.

3. Late sown cotton is less liable to attack.

4. Nyasaland upland is practically disease-resistant, even when grown in wet situations.

Putting this information into practice, owners of plantations on the river were advised only to plant Nyasaland upland in low-lying portions of their estates, and to plant Egyptian where soil aeration and drainage left nothing to be desired. The advice was acted on, and in one district this year there are nearly 1,000 acres of healthy Nyasaland upland in place of the same area of dead and dying Egyptian. The European Egyptian crop, although small, was sold at prices which compared favourably with Egyptian-grown; and now the problem of blight has been solved, I trust that the quality of the crop will improve in future, as there is a considerable shortage in this class of cotton on the market.

The extension of a native cotton industry is of necessity a slow process, but I have little hesitation in saying that in a few years the export of native cotton will be the largest export of the Protectorate.

The future prosperity of Nyasaland as an agricultural country depends principally on the development of her native agriculture, and no crop is more suitable than cotton for this purpose. Government has done everything possible with the means at its disposal to foster this industry, and I am pleased to report that the money spent has been well expended. Since the introduction of native cotton cultivation in Nyasaland by Government it has steadily progressed, and the crop for the year under review amounted to 220 tons, an increase of 130 tons on the previous year. The crop now approaching maturity is favourable, and as the distribution of seed is practically double that of last year, it is anticipated there will be as large an additional increase as in the past season. The quality of the native-grown Nyasaland upland has always been as good as, if not better than, European-grown, but the Egyptian crop was very disappointing in the past, being largely composed of mixed staple. Last season, a marked improvement has been brought about by teaching the natives how to grade, and a large quantity of the Port Herald native crop obtained 1*s.* 1*d.* per lb., one of the highest prices obtained for Egyptian-grown in the Protectorate. This is simply a case in point to show the necessity of enlarging the staff of agricultural inspectors to supervise the native crop. The greatest difficulty encountered is to induce natives to thin their cotton to two plants at most; they always wish to leave six to ten plants at one place as with maize, thinking the larger number of plants will give the heavier yield. One of the great drawbacks to the native cotton industry is the distance between some of the cotton fields and the ginneries, but I am pleased to report that the British Cotton Growing Association is establishing a ginnery at Port Herald, in the largest native cotton centre of the Protectorate, and trust that they may be encouraged to erect another near Lake Nyasa, to gin the cotton produced on the lake.

Barium in United States Soils.—It appears that barium is a widely disseminated element and is present in most soils throughout the United States, and in larger quantities, as would be expected, in soils derived from masses carrying barytic deposits, and in the soils derived from the rocks of the Rocky Mountains. The soil moisture may be expected to carry small amounts of barium. In all cases the felspars of the igneous rocks from which the soil material has been derived seem to be an original source of the barium of soils. (Bureau of Soils, United States Department of Agriculture, Bulletin No. 72.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The subject of the editorial in the present issue is The Centralization of Agricultural Research. It should serve to indicate the economy and efficiency that are gained when one scientific staff is employed for the interests of several subsidiary stations.

Megass receives attention, in two articles on page 355, which deal especially with experiments that are to be made in drying megass for use in furnaces, and with methods for the analysis of this by-product in sugar manufacture.

An article on page 356 gives interesting information, which shows that citrus budwood from Florida may be used with success on West Indian stocks, at any rate as far as the grape-fruit is concerned.

An account of recent work of the British Cotton-Growing Association is given on page 358. This had relation, more especially, to West Africa, Uganda, Nyasaland and Rhodesia.

The Insect Notes, on page 362, present an interesting article on scale insects and black blight in Grenada.

Page 363 contains reviews of the Annual Reports on the Botanic Stations, etc., in Antigua and British Honduras.

The subject of the Fungus Notes on page 366, in this issue, is the root disease of various plants, more especially cacao and limes.

The Use of the Nitrogen-Fixing Organisms in the Soil.

This matter has a particular importance in relation to the employment of molasses for the purpose of increasing the fertility of soils—a subject that received attention in the last number of the *Agricultural News.* A short note is given, in *The Sugar Beet* for October 1910, describing the outlines of experiments that are being conducted in connexion with the matter, on soils used for beet-raising. In these, a solution was prepared containing glucose 20 grams, potassium phosphate 0·5 grams and calcium carbonate 5 grams, to a litre of water; this was sterilized, sprinkled with pure cultures of nitrogen-fixing organisms, and left at a temperature of 20°C. for a month. Soil which was sprinkled with material from such preparations, and then ploughed under, gave increased crops.

Another more effective method, for inoculating soils was found to be to saturate several cubic metres of soil with a 1- to 2-per cent. sugar solution, or with molasses, and then to spread this on the ground, together with cultures of the nitrogen-fixing organisms. It was found that soils inoculated in this way gave heavier crops of beet, of a better quality than those grown on soils that were not so treated.

Castilloa Cultivation in Jamaica.

The *Journal of the Jamaica Agricultural Society,* for September, 1910, contains an article by the Hon. H. H. Cousins, M.A., F.C.S., Director of Agriculture, in which suggestions are given as to the cultivation of Castilloa rubber in Jamaica. It is first pointed out that plants were brought to Jamaica from Kew in 1881, and that a tree from these, growing at the Royal Gardens, was used for purposes of propagation. This makes it fairly certain that all trees of Castilloa in Jamaica, more than fifteen years old, were planted from material obtained from this tree. Plants have been subsequently raised from seed obtained from British Honduras. All these have been shown to be plants of *Castilloa guatemaltica.*

An account is given of Costa Rica Castilloa (*Castilloa costaricana*), and it is mentioned that, on the Pacific side of Costa Rica, there exists a drought-resistant Castilloa possessing olive-green flowers; this seems to be suitable to conditions in Jamaica, and will be tried there shortly.

Attention is given to climatic and geographical conditions which make it appear likely that the first-mentioned species of Castilloa would be much more suited for growing in Jamaica than the latter, and planters are advised to give due regard to these considerations before they employ, in any quantity, Costa Rican seed in their Castilloa plantations.

The question of the use of Castilloa as a shade for cacao receives attention, and the opinion is given that experience is showing that it is not sound practice to grow Castilloa as a shade for cacao, and that this rubber tree should be planted by itself, if the best results are desired.

The Trade of Gambia 1909.

Information concerning the trade of this colony is given in the *Gambia Government Gazette* for August 3, 1910. This shows that the exports of the chief products during 1909 had the following values: ground nuts £323,231, hides £8,520, palm kernels £3,526, wax £2,180, rubber £1,550.

The crop of ground nuts was a record one, the quantity exported being 53,644 tons, as compared with 31,964 tons in 1908. The commencement of this trade was on account of the demand for ground nuts in the United Kingdom and the United States; but the product is now almost entirely exported to France. Attempts are being made, however, to increase the trade with the United Kingdom.

The 'Sick' Soils of Porto Rico

It has long been known that certain soils, even when they are in receipt of a plentiful supply of manure, gradually lose their power to produce good crops. The terms 'sick' and 'tired' have been used to describe a condition for which satisfactory explanations have only been found recently. It has been demonstrated that apparent soil sickness is due either to the presence of pests, such as eel-worms, on the roots, or to the existence of conditions in the soil itself which are inimical to the growth of plants. It is the latter state, only, that can be described correctly as soil sickness.

The circumstances of soils in which these conditions have arisen receive attention in Circular No. 12 of the Porto Rico Agricultural Experiment Station, entitled *On the 'Sick' Soils of Porto Rico*. It is pointed out, first of all, in this publication, that sick soils cannot be made fertile by applications of manure: this is the chief characteristic which serves to distinguish them from 'worn out' or exhausted soils. A predisposing cause of sickness is the continual application of organic manures that have not been previously rotted; common examples of such manures are, as is stated in the Circular, tankage, dried blood, cotton seed meal and fresh pen manure. The use of these, year after year, on the same soil, causes an increase of certain fungi and bacteria in it, which feed on the organic matter, and by fermentation, convert it into formic, acetic, butyric, or other injurious acids. It is in heavy, badly aerated soils that these are specially found, and their numbers are naturally greatest near the surface of dead and living roots. Not only the harmful acids mentioned are produced, but poisons of a different nature, such as sulphuretted hydrogen, and other, more complex, bodies.

It is a curious fact that the investigations with sick soils in Porto Rico showed that little damage was suffered by them through the action of denitrifying organisms. The harm was found to be caused by an unwonted increase in the numbers of the butyric organism (*Clostridium pastorianum*). This is a nitrogen gatherer; but the good that it might do through the possession of this property, when it is present in any numbers, is more than counterbalanced by its production of butyric acid, so that partial disinfection by sunlight, or by carbon bisulphide is the remedy recommended for sick soils.

The Requisites in Paper-Making Material.

In an article, dealing with the question of suitable fibres for paper-making, which appeared in the *Paper Trade Review* for March 11, 1910, a list of tests is given which should be applied to fibrous material, and to the conditions surrounding its production, in order that the suitability for the purpose may be determined. These refer to products that are being raised or employed in the special connexion, and one of the most important among them is that the material cannot be employed in any other economic direction. It must be reproduced naturally, and not easily exhausted through regular collection. As regards its production, little cultivation must be needed, and the time it takes to attain maturity must have a suitable relation to the rate of its required supply; in addition, its habit must be gregarious, and it must occur sufficiently abundantly to enable the cutting and collection of it to be effected cheaply. As regards the last matter, it is evident that it must grow in a locality where labour is cheap.

Finally, as regards the requisites more closely connected with manufacture, the total quantity available, within economic collecting distance from the mill, must be sufficient to produce at least 25,000 tons of pulp annually, and the material should contain at least 30 per cent. of cellulose.

Catch Crops in Lime Cultivation.

Varying results have been obtained, under differing conditions, when the employment of catch crops during the first two or three years of the growth of lime trees has been attempted. It is interesting to note, in this connexion, the results that have been obtained at the Onderneeming School Farm, British Guiana; these are described in the annual report on that institution for 1909-10. The original purpose of the experiment was to afford a demonstration as to the comparative ease with which permanent cultivations of limes may be established, without the entailment of any serious interference with the crops of ground provisions that are being raised on the land.

In the experiment, lime seedlings were planted, three years ago, in a small 2-acre field, plantains and cassava being grown at the same time. Entirely satisfactory results were obtained, for the yield from the food crops was good, and the lime trees made vigorous growth; so that on the discontinuation of the raising of the catch crops, a lime field has been obtained which presents a model appearance.

In continuation of the object-lesson, other areas are being treated in the same way, the catch crops being corn, plantains, eddos, tanias and similar plants, while, where the soil is sandy and less fertile, cocoa-nuts have been planted at proper distances, and sweet potatos are being raised at present, as well.

INSECT NOTES.

SCALE INSECTS AND BLACK BLIGHT IN GRENADA.

A paper on this subject, by Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture, Grenada, was brought up for discussion at a meeting of the Agricultural and Commercial Society in that island, in September last. This is of considerable interest, as it summarizes much of the latest work that has been done in Grenada, in this connexion, so that the following abstract of it is presented here.

Consideration was given, first, to the way in which the fungi obtain their food, and it was shown that this is dependent upon whether they happen to be parasites or saprophytes; in the former case they obtain nutriment directly from living plants or animals; in the latter, they feed on dead matter. The important point is that black blight (*Capnodium* sp.) belongs to the latter class of fungi. The cells of which it is composed are able to absorb sugary liquids through their walls and to use them in growing, and producing new cells. In the special instance, the sugary liquid employed is obtained from animals. The question for consideration, then, has to do with the way in which this material is provided. If this matter is explained, valuable indications are obtained as to the way in which black blight may be controlled.

The sugary liquid is made up of the excretions of scale insects and mealy bugs. It is therefore to these animals that attention must be given, when means are being devised for combating the pest. Thirteen varieties of such insects have been found in Grenada, so far, by Mr. Auchinleck, who exhibited specimens of the most common kinds, as follows: the mango scale, on mangos, honeysuckle, guavas, cashews and imported plants; the line scale, on mangos and Strychnos; the star scale, on the mango and oleander; Barber's mealy bug, on cacao; the black scale, on the 'almond', pigeon peas and the star apple; and the red scale, on tamarinds. It was pointed out that the last scale presents a curious characteristic in that it is one of the few that are commonly found on the upper surface of leaves; the circumstance is due to the fact that the leaflets of the tamarind close together at night, and thus cause the upper surfaces to be more adequately protected from dews than the lower ones.

All the insects mentioned belong to the order of the bugs, or Hemiptera (see *Agricultural News*, Vol. VII, p. 138). These possess mouth parts suited for sucking, and the females are often wingless, and thus cannot travel far. Some of them are able to give out a sweet liquid in fairly large quantities, and it is on this that the black blight lives as a saprophyte. Among animals that make use of this liquid as food are ants, which do not destroy the insects which produce it, as is sometimes supposed, but seek the secretion for their own uses.

These matters lead to the consideration of the methods that may be employed for controlling black blight. They may be divided into (1) artificial methods and (2) natural methods. Among the former are included the lopping of infested trees; the entire removal of the leaves by plucking; the treatment of trees with white lime; spraying with whale oil soap, kerosene and various oily compounds; the fumigation of trees; and the dusting of the plants with dry contact poisons, such as sulphur or Paris green. These are not presented as being necessarily of a practical nature; they are suggestive, and are forming the subject of experiments in Grenada. The following table gives particulars of actual trials that have been made:—

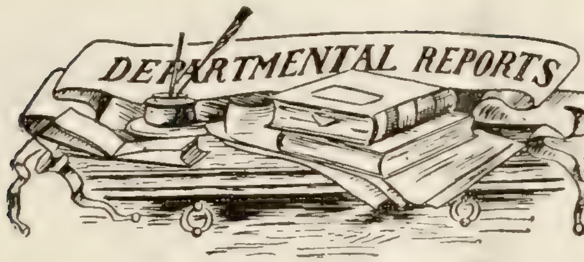
Treatment.	No. of trees.	Cost per tree.
Removing leaves	1	6*d*.
Spraying with kerosene	...	6*d*.
Fumigating (shrubs)	4	9*d*.
Dusting with sulphur (four times)	2	1*s*.
,, ,, Paris green	4	2*s*.
Spraying with whale oil (large trees)	...	10*s*.

It should be stated that experiments in lopping and liming were made with trees, when it was found, in some cases, that the cost of treatment was entirely covered by the returns from the sale of the cordwood obtained, even after the cost of the lime-wash used had been deducted.

An enumeration is made of the chief objections to the artificial treatment of plants for black blight. They are: the cost of materials and of labour; the unsightly appearance of lopped trees; the loss of fruit resulting from heavy pruning; and the destruction of beneficial insects, together with the harmful ones. These objections have caused attention to be turned to natural methods of control, and much work is being done in this direction, particularly on the part of the Imperial Department of Agriculture, especially as regards the study of the natural parasites of scale insects. As a result of this work, four fungi which destroy scale insects have been recognized in the West Indies (see *Agricultural News*, Vol. VIII, pp. 299 and 411), and studies of the life-history of lady-birds and minute insects, which are the enemies of scale insects, have been made. As far as Grenada is concerned, two insect parasites of the scales have been found, namely lady-birds destroying the orange mussel scale, and a minute insect which is parasitic on the black scale; while of fungi, the red-headed fungus (*Sphaerostilbe coccophila*) and the shield scale fungus have been found.

As the present article is more particularly concerned with the insect enemies of the scale insects that are followed by black blight, special attention will be given to these. The lady-birds are predaceous; this means that they actually devour the scale insect; and each kind of lady-bird generally feeds on one kind of scale insect, only. That these useful insects do not effect more in the reduction of the numbers of scales in Grenada is probably because they are themselves destroyed to a large extent by their natural enemies. The insects that are parasitic on scale insects are so minute as to be hardly visible to the naked eye. It is the larvae of these that destroy the scale insects, for their eggs are laid in the bodies of the latter, and the larvae when hatched proceed to feed on the scales. It has been recommended by Mr. H. A. Ballou, M.Sc., Entomologist to the Department, that use of these flies may be made by enclosing branches of trees, having infected scales on them, with muslin bags, and then employing the flies thus collected to infest other scales.

Mr. Auchinleck's interesting paper concludes with descriptions of the two fungi that have been found to occur in Grenada, which are parasitic on the scale insect. In connexion with these, reference may be made to the article in the *Agricultural News* quoted above.



ANTIGUA: REPORTS ON THE BOTANIC STATION, EXPERIMENT PLOTS AND AGRICULTURAL EDUCATION, 1909-10.

The expenditure in connexion with these stations, during the period under review was £747 3*s.* 7*d.*, of which £72 2*s.* 3*d.* was spent on Special Services. The difference between these sums—£675 1*s.* 4*d.*—was supplied from Imperial and local funds, the respective contributions being £401 2*s.* 5*d.* and £273 18*s.* 11*d.* The receipts for the year amounted to £113 18*s.* 5*d.*, of which £45 3*s.* 2*d.* came from the sale of plants and seeds for minor industries; a large proportion of the balance was derived from sales of sugar-cane cuttings.

An interesting matter in the report is that the distribution of plants was greater than that recorded at any former period; it amounted to 180,696, in which number 157,557 sugar-cane cuttings are included. There was, besides this, a large distribution of seeds of green dressings, food plants, cotton, soy beans, and others, and of ordinary cuttings such as those of the sweet potato. The amount of onion seed distributed was 322½ ℔., of which 125½ ℔. was used in Antigua, and the remainder in other Presidencies in the Leeward Islands.

An attempt was made to continue experiments which have for their object the gaining of information as to the capacity of the flower-bud maggot of the wild coffee (*Clerodendron aculeatum*) to attack cotton, and to find out if the flower-bud maggot of cotton (*Contarinia gossypii*) is identical with the former. These failed, because infested buds of the wild coffee could not be found. Trials were also made for the purpose of seeing if the leaf-blister mite of Acacia could infest cotton. These indicated that this was not the case. Other work in connexion with cotton, at the Botanic Station, has included the commencement of experiments in the crossing of different varieties.

An account is given, in the report, of an agricultural show which was held in St. John's on December 2, 1909.

The rainfall at the Botanic Station, during 1909-10, was 50·59 inches, as compared with 49·54 inches in the preceding period.

Useful information is presented in relation to the cotton industry. This shows that the area planted in Antigua was 252 acres, which produced a return of 37,400 ℔., for the season. Thus the yield was 150 ℔. of lint to the acre, which is good, considering that part of the cotton was grown as an intermediate crop. The amount of cotton exported from Barbuda was 22,560 ℔., from 125 acres; so that the whole export, including the produce of Antigua and Barbuda, was 59,960 ℔. Prices were good during the season, as much as 23*d.* per ℔. being obtained in some cases. The general prospects of the cotton industry in Antigua appeared to have decidedly improved, and it seems that the growing of this plant, in rotation with cane, is likely to be adopted in the island to a useful extent in the near future.

Another industry which is showing encouraging progress is the production of limes. Evidence of this is given by the largely increased distribution of lime plants from the station, which was nearly twice as great as it had been in any preceding year, with the exception of 1907-8. Another industry which shows signs of growth is the raising of cocoa-nuts; while the onion industry in Antigua appears to have attained a stable footing. Steady efforts are being made in order to increase the interest in the growing of broom corn, which should become a subsidiary crop of some little importance, in Antigua.

The most extensive of the experiments conducted at the stations are those with sugar-cane. These receive detailed attention in separate reports, issued under the title of Sugar-cane Experiments in the Leeward Islands.

The trials made at the Skerretts experiment station mainly included those with provision crops, oil crops, green dressings and fodder crops. At Scott's Hill, the station was used chiefly as a nursery, and for experiments in different methods of tree-planting. At the former station, work in cotton selection is being conducted, which should have the greatest use in relation to the industry concerned with the raising of this crop.

The report concludes with the usual account of the work that has been done in the classes held by the Agricultural and Science Master.

BRITISH HONDURAS: REPORT ON THE BOTANIC STATION, 1909.

This report shows that, as in 1907 and 1908, the weather was most unfavourable to agriculture during the first half of the year; in the period under review, however, heavy rains fell toward the end of the time. The total rainfall at the Botanic Station was 57·99 inches.

Among the various experiments that are being conducted, those with rubber show that Para, Castilloa (which is indigenous) and Funtumia rubbers are making good progress, though the growth of the two last-mentioned kinds is slow. Success is being experienced in the trials with rice; ginger: arrowroot; seedling canes B. 208 and D. 95, received from the Imperial Department of Agriculture; pine-apples and the sunflower. Trials with English potatos have not met with success during the season. Other experiments are concerned with sesame, onions, limes, cocoa-nuts and oranges; these do not appear to have become sufficiently advanced, yet, to give definite results.

Among useful fruit plants with which trials are being made are the Jack fruit (*Artocarpus integrifolia*), bread fruit (*Artocarpus incisa*), Malacca apple (*Eugenia malaccensis*), myrtle berry (*Eugenia edulis*), loquat (*Eriobotrya japonica*), Mabola (*Diospyros Mabola*), Carambola (*Averrhoa Carambola*), genip (*Melicocca bijuga*); cinnamon (*Cinnamomum zeylanicum*), mangos, oranges, gamboge (*Garcinia* sp.), custard apple (*Anona muricata*), *Colvillea racemosa*, and ylang-ylang (*Cananga odorata*).

The distribution has included 8,896 plants, which consisted of Para rubber, cocoa-nuts, coffee and ginger, as well as ornamental plants. Para rubber seeds are being imported, in added quantities, from Singapore, for raising plants for future use.

Among the new and valuable plants imported during the year were varieties of grapes, oranges, mangos, pecans, plums and peaches.

Trials were made with leguminous cover crops; they included Bengal beans, sword beans, *Crotalaria striata* and *Triphasia* sp. All these were successfully raised, a cover 4 feet deep being obtained from the seeds of the first-named that were planted.

GLEANINGS.

The *Board of Trade Journal* for October 6, 1910, shows that the exports of rubber, of domestic production, from Ceylon during last July were 2,254 cwt. The shipments for the same month of last year amounted to 1,055 cwt.

Information has been received from the Curator of the Botanic Station, Antigua, as to the state of the cotton crop in that island, in regard to insect pests. This shows that, although some attacks by caterpillars had been experienced, the flower-bud maggot had not appeared, at any rate up to the end of October.

The *Experiment Station Record* of the United States Department of Agriculture, Vol. XXII, No. 8, p. 719, gives a note of a paper by H. Pellet, in which it is concluded by the author, from analyses of the deposits in furnaces in which molasses is burnt, that a loss of potash takes place not only through the volatilization of potassium sulphide, as has been suggested, but also because of the volatilization of other potash salts.

A History of British Mammals, by G. E. H. Barrett-Hamilton, B.A., M.R.I.A., F.Z.S., is being published by Messrs. Gurney and Jackson, 10, Paternoster Row, London, E.C. This will be issued in about twenty-four monthly parts, making three volumes, at the price of 2*s.* 6*d.* net, for each part. The complete work will contain twenty-seven full page plates in colour, fifty-four in black and white, and upwards of 250 smaller illustrations.

According to the Grenada *Government Gazette* (Extraordinary) for October 7, 1910, an order in Council, dated September 16, 1910, has been made, under the Import Duties Ordinance, 1905, whereby live stock may be imported into the island, 'in cases where the Governor-in-Council is satisfied upon documentary or other sufficient evidence, that the importation of any animal or animals is likely to improve the breed of such animal already in the Colony.'

The *Colonial Office Journal* for October 1910, p. 140, states that Messrs. John Downham & Co. have produced a decorticating machine which, it is claimed, can deal with 120,000 to 150,000 leaves in ten hours, and will extract 97 to 98 per cent. of the available fibre. The machine is described as being of solid construction, and free from vibration. The price is £600—the same as that of the 'World's Decorticator', which was described in the *Agricultural News*, Vol. VIII, p. 293. Mention was made of other decorticating machines in the *Agricultural News*, Vol. IX, p. 156.

A meeting was held at the Head Office of the Department, on October 27, 1910, for the purpose of discussing preliminary matters in connexion with the proposed formation of a Goat Society in Barbados. At this, arrangements were made for holding a larger meeting of those interested in the matter, and a scheme of subjects for discussion at that meeting was drawn up, following suggestions by the Imperial Commissioner of Agriculture.

H M. Trade Commissioner for Canada in England (Mr. R. Grigg) reports that two Commissioners have been appointed by the Canadian Department of Agriculture for the purpose of investigating the causes of the decline of sheep-rearing in Canada, with a view to the adoption of a comprehensive policy on the part of the Canadian Government, and the undertaking of definite and extended measures that will be likely to operate toward the encouragement, improvement and development of the industry as a whole. (The *Board of Trade Journal*, September 22, 1910.)

The *Planters' Chronicle* for June 4, 1910, gives an address by Mr. R. D. Anstead, B.A., Scientific Officer to the United Planters' Association of Southern India, and lately Superintendent of Agriculture, Grenada, in which he states that he had seen, in Southern India, plants of *Manihot dichotoma* and *M. piauhyensis* growing successfully in a light soil, at an elevation of 5,450 feet, and with an annual rainfall of 50 inches. The trees were one year old, and had attained a height of 6 to 8 feet, with the first branches 3 feet from the ground.

A description is contained, in a recent number of *Teysmannia* (Vol. XXI, p. 60) of a new disease of coffee which resembles, in many respects, *Rostrella coffeae*, except that it attacks the roots as well as the stem. Careful examination of the wood of diseased trees showed that the fungus caused dark-brown areas to be formed on the wood, beneath the bark: these latter are likely to appear later as brown or black spots on the bark. The fact that the disease attacks the roots makes its control, by cutting down the trees, impossible. It can only be eradicated by digging up, and burning, the affected plants.

During last month, Proclamations were made, in Antigua and Dominica, under the Plants Protection Act, No. 4 of 1897, Antigua, and the Plants Protection Ordinance, 1907, Dominica, respectively, by which the importation into these Presidencies of any banana plants, or any material for planting or articles connected therewith, is prevented from all countries of Central and South America, and from Trinidad. The same Proclamations prohibit absolutely the importation into those Presidencies of all cocoa-nuts, cocoa-nut plants or any material for planting or articles connected therewith, from Cuba, Jamaica, Trinidad and all countries of Central and South America.

In *Science*, Vol. XXXI, p. 434, a summary is given of the results of experiments with Guayule rubber (*Parthenium argentatum*) which was grown under irrigation in Mexico, for two years. At the end of the time, the irrigated plants had made eight times as much growth as those which were not irrigated, but were only found to contain minute quantities of rubber. Under conditions of drought, however, or when the irrigation water was withheld, the amount of rubber in such plants increased; and the conclusion is reached from the trials, that although rapidly growing Guayule plants may only contain a small amount of rubber, this may approach the maximum in dry seasons.

STUDENTS' CORNER.

NOVEMBER.

SECOND PERIOD.

Seasonal Notes.

The cotton crop will have become sufficiently advanced, at the present time, to admit of the commencement of selection in the field. It has been proved completely that selection on the basis, merely, of the characters shown by the lint and seed is insufficient, in the case of cotton, to ensure that the best types of plants bearing the best kind of product shall be obtained in the next crop. The planter, or his assistants, must visit the fields, and must pick out, and mark, the plants that appear to be most useful for his purpose, in such a way as to enable the seed-cotton from these to be collected separately, for the special examination of this that will be conducted later. For particulars and illustrative examples in connexion with this selection, reference may be made to the *West Indian Bulletin*, Vols. IV, p. 208; VII, p. 153; X, p. 79; as well as to the *Agricultural News*, Vols. VII, p. 134; VIII, p. 374. It will be useful, before carrying out such selection for its definite purpose, for those who are engaged in the work to give themselves some preliminary practice in the matter. One of the best ways of doing this is for two or more of those interested to meet together and afford assistance to one another in the following way. Fifty plants, growing alongside each other in one row, are chosen for the purpose of making the observations. Each observer passes separately and independently down the row, and carefully chooses what he considers to be the six best plants, at the same time making notes of the reasons which lead him to select those particular plants. He should not mark the plants selected, or in any way leave signs which may indicate the objects of his selection; he can most usefully arrange for identifying them later by noting their numbers, in order, from one end of the row. After the independent selections have been made, the plants that have been chosen are visited, when the observers compare notes, and criticize each other's reasons for making those selections. It is easy to see that, under ordinary conditions, the smaller the total number of plants selected, the more likely is the choice of each of the observers to be a good one, when he comes to do the serious work, later. In any case, an exercise of this kind affords good practice in selection, and will help to prevent the giving of a disproportionate amount of attention, by any one observer, to some special characteristic of the cotton plant, when he is making a choice of the best kinds.

Shipments of fruit, in quantity, are now being made from some of the West Indian islands. As much information as possible should be gained in connexion with the picking and curing of fruit for export, as well as in relation to the grading, wrapping and packing of this product. What is meant by the grading of fruit, and why is it necessary that this should be conducted with care? Give an account of the most suitable fruits for export that are produced in the district in which you live, and state how each of these should be packed. Mention any difficulties, of which you have knowledge, that are connected with the export of fruit from the West Indies.

Parts of sugar-cane fields often consist of soil that has been placed in depressions such as ponds and water-holes, for the purpose of filling them up. A matter of interest is to compare the growth of canes in such places with the ordinary growth of those in the field. It is especially the case, where the soil is generally thin, that this growth will be better than that of the other canes. Consider the possible reasons for this, in the light of the larger water-content and thickness of the soil, in such places, and the chance that the existence of such a circumstance gives for the greater presence of nitrifying and nitrogen-fixing organisms there. Discuss the question, also, in view of the possible larger plant food content of the soil, and in regard to the effect of its greater thickness, in relation to the growth of roots.

In some parts of the world, molasses is applied, to a fairly common extent, to soils on which the sugar-cane is grown, when it is found that increased yields of cane are obtained, which are out of all proportion to any manurial value that the molasses may possess. By this is meant that the application, in the ordinary way, of the same amounts of nitrogen, potash and phosphoric acid as there are in the molasses, would not have given anything like the same increase of crop. Is there any way of accounting for the action of the molasses, and of explaining its influence on the fertility of the soil? If so, describe it, and state what light the matters that have to be considered throw on the causes of soil productivity. Information in connexion with the subject may be found in the last number of the *Agricultural News*, and in Vol. VII, p. 227, of this publication, as well as in Pamphlet 64 of the Department Series, in which a description is given of experiments that are being carried out in Antigua, in relation to the matter. Useful collateral information is also contained in the *West Indian Bulletin*, Vol. VIII, p. 94.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the chief causes that influence the direction taken by the roots of plants in the soil?

(2) How is a certain amount of water retained in the soil, in spite of drainage?

(3) If it became necessary to apply manure to lime trees at the time of full bearing, what would you use?

INTERMEDIATE QUESTIONS.

(1) What general objections are there to growing more than one crop on the same piece of land, at the same time? Under what conditions is it permissible to do this?

(2) What is the effect of applications of nitrate of soda to heavy clay soils? How would you try to remedy the harm done by such applications?

(3) Give an account of the chief fungus pests of cotton in your district.

FINAL QUESTIONS.

(1) What useful purposes are served by the taking of periodical inventories on estates? How would you arrange for this to be done, under conditions with which you are familiar?

(2) Give an account of the way in which the various manures are provided, and used, on a sugar estate, including in your answer: pen manures, artificial manures and green dressings.

(3) What kinds of ploughs are most suited to the district in which you are employed, and what circumstances render them particularly useful in that district?

FUNGUS NOTES.

ROOT DISEASE OF CACAO, LIMES, AND OTHER PLANTS.

The attention of the Mycologist on the staff of the Department has been called, during the past year, to the occurrence of root disease of limes in St. Lucia, Dominica, Montserrat and Antigua, and of cacao more particularly in St. Lucia. Examination of the various specimens of lime trees sent to the Head Office from the islands mentioned seems to indicate that the disease is different in symptoms and origin in different localities. One form, however, which occurs in Dominica, and possibly also in St. Lucia, appears to be due to the same fungus as that causing the disease of cacao. This similarity is manifested, not only in the nature of the mycelia of the two fungi, but also in their method of attack. In consequence of this, it is intended to deal with the disease of these two host plants together, in this article, and to leave the discussion of the other forms of lime root disease for some future occasion.

DESCRIPTION OF THE DISEASE. It would seem that the disease under consideration is the same as one which has long been known in the West Indies; though certain characters of the causative fungus, as recently examined, are not very clearly indicated in the former publications on the subject, and there is consequently a possibility that the two fungi are not entirely identical. (See *West Indian Bulletin*, Vol. IX, pp. 167-70, and Pamphlet No. 54 of the Department Series.) The symptoms of the disease as recently met with are briefly as follows: Badly attacked specimens, on examination, are seen to be entirely deprived of their small lateral roots, and even the principal roots are dead. The bark of the latter is blackened and shrunken, while the wood is frequently grey in colour. On the surface of the diseased roots is a mass of dark-grey or brown fungus mycelium, usually covered to some extent by earth. The external symptoms often extend to the collar, which in some instances is completely ringed. When this is the case, the tree is dead. On removing the bark the position once occupied by the cambium is seen to be filled with white, or yellowish, fan-shaped strands of mycelium closely adpressed to the bark on one side, and to the wood on the other. Inside this, the wood is grey and often exhibits very narrow, longitudinal, black streaks with a white centre, due to the presence of narrow cavities lined by the black hyphae of the fungus, the hyphae inside this lining being white. On the broken ends of roots, a web of grey or greenish-grey hyphae develops, which certainly belongs to the same fungus as the other forms so far mentioned. Inside the dead bark, a black stroma of the same fungus is often formed, but no fructifications definitely associated with this disease have as yet been found. In addition to the mycelium described already, loosely woven strands of hyphae of a yellow colour may also be observed on the surface of some of the specimens. This form appears to agree more accurately than the former with the descriptions of root disease of cacao published previously in the *West Indian Bulletin*. Lastly, bright, pink, Stilbum-like fructifications, surmounted by a spherical head of white spores have been found. In one instance, these appeared to be associated with a flat brown stroma about 3 mm. thick, but varying considerably in width and length, and occurring on parts of the collar of the specimen, beneath the bark. It could not be definitely determined if all these forms were independent, or if they were all manifestations of the same fungus.

GENERAL CONSIDERATIONS. This fungus has also been found attacking the immortel shade tree (*Erythrina velutina*) in addition to limes and cacao, and the pigeon pea (*Cajanus indicus*), in St. Lucia. If, as is almost certain, it is the same as that described previously, the list of host plants is as follows: cacao, lime, breadfruit, breadnut, mango, pomme rose, pois-doux, avocado pear, immortel and pigeon pea. There is also a decided possibility that it is the same as the fungus attacking the roots of coffee and pois-doux in Guadeloupe. In many instances, the fungus originates on decaying forest stumps left in the plantation; from these it can spread to cacao or limes. In other instances, the attack may originate in shade belts of any of the above-mentioned trees, and from them spread to cacao. In the case of limes, the attacks have up to the present been almost entirely confined to isolated trees, occurring here and there, more especially on newly cleared estates. In such cases, it is usually found that there is a decaying stump in the neighbourhood of the tree attacked, from which the fungus has been enabled to spread to the lime tree. The general experience has been that if such trees are carefully removed and burned, and the soil around them treated with lime, no further trouble occurs, and supplies can safely be put in, six months after the destruction of the tree. In the case of cacao, the sequence of events is often somewhat different. The disease may appear suddenly on three or four trees at once; in this case it is usually found that the trees are arranged approximately in a circle around some source of infection. Under such circumstances, the diseased trees should be isolated by a trench, and all those badly attacked should be dug up and burned, the soil being treated with lime as is mentioned above. Similar measures may be employed for preventing the spread of the disease along a wind-break.

FACTORS INFLUENCING THE DISEASE. In many instances, the primary cause of the disease is, as has been stated already, the presence of decaying forest stumps in the soil; but this is not always the case. It would seem that, occasionally, the fungus is able to attack shade trees directly; though it is somewhat difficult to understand by what method it is dispersed, as it never appears to form spores. The only alternative mode of infection is by means of mycelium spreading through the soil and living on small pieces of decaying vegetation that happen to be present. When such a mycelium encounters the living roots of shade trees, more particularly those of breadfruit and avocado pear, it must be able to attack them directly and ultimately cause the death of the trees. There is a very great probability that before this happens, other trees in the neighbourhood have already become infected, and this accounts for the subsequent death of several more trees in the infected area. Consequently, care should be taken to remove decaying stumps as far as is practicable, and to choose hardy trees for wind-belts, or for shade purposes. Another very important consideration is that of drainage. When trees are growing in a water-logged soil, or one which is subject to occasional inundations, some of their roots may be actually drowned, since the water prevents them from obtaining the necessary supply of oxygen. Such dead roots then serve as sources of food to the fungus, if it is present, and enable it to develop the additional vigour necessary for its spread to the living tissues. Trees growing in unsuitable soil, or in wind-swept situations, are also weakened in vigour, and consequently are less able to resist the fungus. It has been found, on certain estates in Dominica, that soil which is unsuitable to cacao can be used for the cultivation of limes. The latter are planted between the cacao trees, and as they grow up, the original crop is removed, and the limes are left alone. This course would

probably be found advisable in other islands, where cacao is in an unhealthy condition owing to the unsuitability of the soil.

IMPORTANCE OF THE DISEASE. The sudden manner in which affected trees die often leads to the erroneous conclusion that the spread of this fungus is very rapid. In all probability this is not the case. The trees have usually been diseased for some time before they die, as death does not take place until the bark of the main root, or collar, has been completely ringed. Once this occurs, the trees succumb rapidly. Taking everything into consideration, it cannot be said that this disease is a really serious one. The fact that no spores are formed practically prevents it from ever becoming suddenly epidemic, while the growth of the mycelium through the soil must necessarily be somewhat slow. Furthermore, it has been demonstrated frequently that it can easily be controlled by the use of methods that are now a matter of common knowledge. In fact, if thoroughly concerted efforts were made in each island, it would be possible to reduce this disease to such an extent, that only one or two isolated cases would occur in any year on old estates, and but few more on estates recently cleared.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of September:—

The month of September has been marked in Mincing Lane, week by week, by a general improvement in business, and a distinct upward tendency in prices realized for many well-known products. The supply of, and demand for, most things have been equally favourable. None of the articles that have been specialized, however, were of West Indian origin, as will be seen from the following details.

GINGER.

In this article there has been little or no demand, either for Jamaica, Cochin or Calicut. In the middle of the month, some 50 odd barrels of Jamaica were brought forward; but the whole of them were bought in at 60*s.* for bold, and 50*s.* to 58*s.* for fair washed. At the end of the month, the quotations for Calicut ranged from 90*s.* for the best quality, to 45*s.* for brown tips and cuttings.

NUTMEGS AND MACE.

There has been a steady demand for both these spices. For nutmegs, the following prices have ruled: 9*d.* for 58's; 5½*d.* for 76's; 5¼*d.* for 70's; and 4½*d.* for 66's. For large West Indian, there has been no demand. At the auction on the 21st, 28 packages of West Indian mace were offered, and sold at the following rates: ordinary to fair, 1*s.* 8*d.* to 1*s.* 10*d.*; red, 1*s.* 7*d.*; and broken, from 1*s.* 5*d.* to 1*s.* 6*d.* A week later, West Indian mace commanded somewhat higher prices, good pale fetching 2*s.*, pale and reddish 1*s.* 9*d.* to 1*s.* 10*d.*, and fair to good red 1*s.* 8*d.* to 1*s.* 9*d.* per lb.

ARROWROOT.

At the auction of the 8th of the month, a large consignment of St. Vincent was brought forward, 800 barrels being sold at from 1¾*d.* to 2*d.* per lb. A week later, arrowroot was represented at auction by 16 half-barrels of Bermuda and 22 cases Natal, all of which were bought in at 1*s.* 9*d.* and 9½*d.* per lb., respectively. At the close of the month it was stated that sales had been effected privately for as many as 1,200 barrels of St. Vincent, at from 1⅞*d.* to 1$\frac{15}{16}$*d.* per. lb.

SARSAPARILLA.

At the first drug sale of the month, the offerings amounted to 12 bales of grey Jamaica, 19 bales of native Jamaica and 25 bales of Honduras. The whole of the grey Jamaica was disposed of at 1*s.* 4*d.* per lb., and 10 bales of the native Jamaica of ordinary greyish to fair red, found buyers at from 10*d.* to 11*d.* per lb. Six out of the 25 packages of Honduras sold at 6*d.* to 6½*d.* per lb., the remaining 19 being bought in at 9*d.* per lb. At auction on the 22nd, no grey Jamaica was offered, but of 24 bales of native Jamaica brought forward, 10 were sold at from 9*d.* to 11*d.* per lb. for dull to fair red. Ten bales of Lima character, rough and chumpy, fetched from 11*d.* to 1*s.* per lb., and 10 of wormy Honduras were disposed of at 6¼*d.* per lb.

TAMARINDS, LIME JUICE, AND KOLA.

In the early part of the month tamarinds were represented by 10 barrels of Antigua, of strong character, which were sold at 10*s.* per cwt.; another 10 packages of fair, but dark, fetched the same price. In the middle of the month, there were small sales of concentrated West Indian lime juice at £18 2*s.* 6*d.* On the 22nd, 18 packages of Jamaica kola were brought forward, and all sold, fair dried realizing from 3¼*d.* to 3½*d.*, the smaller nuts fetching 3*d.*

ROUGH RICE FOR FEEDING HORSES AND MULES.

Experiments dealing with the suitability of rough rice as a food for horses and mules are described in Bulletin No. 122 of the Agricultural Experiment Station of the Louisiana State University. The trials were made because, while there is a prevailing impression that rough rice has a harmful effect upon the digestive organs of animals fed upon it, it is in employment in South Western Louisiana as a food for stock. There was the further consideration that, when the price of other cereal grains used for the purpose is high, and the cost of rice is low, the intelligent use of this might provide a cheapened food, where it is obtainable.

An interesting matter was that, when the question of the crude fibre content of rough rice, as compared with that of rice bran, was raised, it was found that this is 9·3 per cent. in the case of the former, while in the latter it is 14·5 per cent. This gave an additional reason for undertaking experiments in connexion with the suitability of rough rice as food for stock.

The test was made with two mules, which were fed on rations containing gradually increasing proportions of rough rice, until 8 lb., or a little more than this, was fed to each of them, every day. The other constituents of the food were cracked corn, cotton seed meal, blackstrap molasses and Lespedeza hay. The reason for gradually increasing the amount of rice, instead of including the full quantity from the beginning, was to provide a precautionary measure in relation to its possible harmfulness, and a means of watching the deleterious effect, if any, during the time of the experiment.

It was found that rough rice, ground, and in a mixed ration, may be fed with benefit to horses and mules. The amount of rice per head may be 8 lb. for horses or mules doing moderately heavy work and having a live weight of about 1,000 lb. This food ingredient is particularly useful, where it is easily obtainable, at times at which the prices of cereal foods are high.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR October 25, 1910; Messrs. E. A. DE PASS & Co., September 30, 1910.

ARROWROOT—St. Vincent, 2¾*d.* to 3¾*d.*
BALATA—Sheet, 3/3 to 3/4; block, 2/4 to 2/5 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 50/- to 55/6; Jamaica, 48/6 to 53/-.
COFFEE—Jamaica, 45/- to 92/-.
COPRA—West Indian, £28 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 48/- to 50/- per cwt.; low middling to middling, 53/- to 56/-; good bright to fine, 58/- to 62/6.
HONEY—24/6 to 28/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/2; concentrated, £18 2*s.* 6*d.* to £18 5*s.*; Otto of limes (hand pressed), 5/6 to 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, 2⅛*d.*; fair, 2¼*d.*; good, 2⅜*d.* per lb.
RUBBER—Para, fine hard, 6/0¼, fine soft, 5/4; fine Peru, 5/9½ per lb.
RUM—Jamaica, 1/7 to 4/6.
SUGAR—Crystals, 14/9 to 19/-; Muscovado, 11/6 to 14/-; Syrup, 11/9 to 12/-; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., October 14, 1910.

CACAO—Caracas, 11¼c. to 12c.; Grenada, 11⅜c. to 11⅝c.; Trinidad, 11½c. to 11¾c. per lb.; Jamaica, no quotations
COCOA-NUTS—Jamaica, select, \$37·00 to \$38·00; culls, \$22·00 to \$23·00; Trinidad, select, \$37·00 to \$38·00; culls, \$22·00 to \$23·00 per M.
COFFEE—Jamaica, ordinary, 11c.; good ordinary, 11½c. to 11¾c.; and washed, up to 13c. per lb.
GINGER—8¾c. to 12c. per lb.
GOAT SKINS—No quotations.
GRAPE FRUIT—No quotations.
LIMES—\$4·50 to \$5·00.
MACE—35c. to 40c. per lb.
NUTMEGS—110's, 9¼c. per lb.
ORANGES—Jamaica, \$2·50 to \$3·00 per box.
PIMENTO—4c. per lb.
SUGAR—Centrifugals, 96°, 3·90c. per lb.; Muscovados, 89°, 3·40c.; Molasses, 89°, 3·15c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., October 29, 1910.

CACAO—Venezuelan, \$11·50 per fanega; Trinidad, \$11·00 to \$11·50.
COCOA-NUT OIL—\$1·07 per Imperial gallon.
COFFEE—Venezuelan, 17c. per lb.
COPRA—\$5·00 per 100 lb.
DHAL—\$3·80.
ONIONS—\$3·25 to \$3·50 per 100 lb.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$1·50 to \$1·70 per 100 lb.
RICE—Yellow, \$4·35 to \$4·40; White, \$4·75 to \$4·80 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., November 4, 1910; Messrs. T. S. GARRAWAY & Co., November 7, 1910; Messrs. JAMES A. LYNCH & Co., October 31, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$11·00 to \$11·50 per 100 lb.
COCOA-NUTS—\$22·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$14·00 per 100 lb., scarce.
HAY—\$1·20 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·26 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·10 to \$6·40 per bag of 210 lb.; Canada, \$3·45 to \$3·60 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·40 to \$3·00 per 160 lb.
RICE—Ballam, \$4·85; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, October 29, 1910; Messrs. SANDBACH, PARKER & Co., October 28, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·25 to \$9·00 per 200 lb., wanted	\$8·50
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	15c. per lb.	17c. per lb.
Liberian	8½c. per lb.	10c. per lb.
DHAL—	\$3·60 to \$3·70 per bag of 168 lb.	\$3·60 per bag of 168 lb.
Green Dhal	\$4·25	——
EDDOS—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	—	—
Madeira	3c. to 3¼c.	3c. to 3¼c.
PEAS—Split	\$6·00 per bag (210 lb.)	\$6·15 per bag, (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	\$2·50	\$2·50
Lisbon	—	No quotation
POTATOS—Sweet, Barbados	\$1·20 per bag	——
RICE—Ballam	\$4·80 to \$4·90 per 175 lb.	\$4·80
Creole	\$4·50 to \$5·00	\$4·50 to \$5·00
TANNIAS—	\$2·40 per bag	——
YAMS—White	\$2·88	——
Buck	\$2·88	——
SUGAR—Dark crystals	\$2·00 to \$2·30	None
Yellow	\$2·80 to \$3·25	\$2·85 to \$3·00
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·40	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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AGRICULTURAL NEWS.

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CONTENTS.

The Action of Heat on Soils.

IN a previous number of the *Agricultural News**, a note was given on work that had been carried out by S. U. Pickering on the prevention, to some extent, of the germination of seeds in soils that have been heated. This prevention was shown to be due to the presence of some poisonous (toxic) substance. Further, as the degree to which the rate of germination is lessened is approximately proportional to the amounts of soluble organic matter and the soluble nitrogen compounds present, it was suggested that this toxic body must be organic and soluble, and perhaps nitrogenous. There was the further consideration that the results showed that soils, even, which have not been heated above 20° to 30° C. contain a certain proportion of the poisonous bodies. Lastly, the work indicated that a similar action to that from heating could be obtained from the employment of sterilizing agents.†

A series of experiments undertaken by the same investigator for the purpose of determining the nature of this poisonous substance has been described recently‡. The purpose of the first trials was to find out if the analysis of soil extracts would give trustworthy results, for the investigation. This was found to be the case, and a fact that is of general importance has been demonstrated, for it is now known that the extent to which organic matter is present in soils, at any rate in those of the kind investigated, gives useful information as to their nitrogen content.

To return to the determinations in connexion with the changes that occur in soils after being heated, the heating of the soil was continued for two hours, in closed vessels, at the selected temperature. Portions of the soil were then kept in two different ways: firstly, in open glass pans, water being added from time to time to keep the soil saturated, and the soil being broken up occasionally, so as to imitate the conditions of ordinary cultivation; in the second case, the soil, saturated with water as before, was kept in flasks, containing about 15 c.c. of air in addition to the soil, which were hermetically sealed. Ordinary,

* Vol. VIII, p. 281

† See also *Agricultural News*, Vol. IX, p. 33.
‡ See the *Journal of Agricultural Science*, Vol. III, p. 258.

unheated soil, was also kept, under exactly similar conditions. The temperature at which the soil was maintained, during keeping, was about 15°C., in both cases. It was found, in saturating the soils with water, that those which had been heated required less for the purpose than those to which this treatment had not been given. In order to gain an idea of the extent of possible accidental variations, complete duplicate experiments were devised; these showed that such variations were very small. The results obtained indicated that very definite and complex changes occurred during the time that the soils were being kept. In the case of the unheated soils, or those which had not been heated to any large extent, the soluble matter increased during the time of heating while, with the more highly heated ones, it diminished: these changes affected both the organic and the inorganic matter in the soils. There was an intermediate condition, ranging between temperatures of heating of 50° to 105°C., in which there was little or no change in composition. Such were the results obtained in the soils kept in the open pans.

As regards the soils that were kept in sealed flasks, those which were less heated suffered, as before, an increase in the soluble matter; but the diminution in this, that was obtained with the highly heated soils in the open pans was not experienced. In the second instance as a matter of fact, the proportion of organic matter remained almost constant, or even increased slightly; this was also the case with the organic matter. It is thus indicated strongly that the lessening of soluble matter in heated soil exposed to the air is due to oxidation, while the presence or absence of air has nothing to do with the increase in the soluble matter that takes place on keeping the less heated soil. Examination of the results obtained throughout the course of the experiments shows that, even with the less heated soil, there is a decrease in the amount of soluble matter during the first ten days. That this decrease continues longer in the case of the more highly heated soils is due to the fact that these contain a larger proportion of oxidizable matter.

In the investigations, attention was given to the extent to which the reduction of the amount of soluble matter in a heated soil is effected by the action of bacteria, in addition to atmospheric oxidation. It was shown that this reduction takes place largely in the absence of bacteria, even when the soil is not periodically moistened. A matter of interest and importance to the soil investigator is the demonstration that air-dried samples of soil change in composition during the time that they are being stored, previous to analysis.

The last portion of the work was concerned more directly with the comparison of the results of the examination of the soils, in the way described, with the effects on the germination of seeds. It was found that, in the case of the heated soil kept in pans, the decrease in soluble matter was accompanied by a lessening of the retardation of the germination of seeds. A further fact shown was that, though the soluble matter formed in the highly heated soil prevented germination to some extent, the soluble matter that is formed gradually in the less heated soils has no such action. In any case, as regards the first soils, the effect had entirely disappeared by the 106th day, even though the ultimate extent of the decrease in soluble matter had not been reached. Thus it is shown that not all the soluble substance formed in the more highly heated soils is of a toxic nature; but that even after it has disappeared, much of the soluble matter produced by this heating is left. Former experiments had indicated that the amount of retardation of germination was proportional to the increase in the quantity of insoluble organic matter; the subsequent experiments, however, demonstrate that this is not always the case.

Additional observations were made for the purpose of ascertaining if any periodical variation takes place, in regard to the soluble matter in the soil, under ordinary conditions. These showed that the amount of organic and inorganic matter decreased throughout the earlier part of the year, but increased subsequently. It is suggested that this may be due, under the conditions of the trial, simply to the effect of rainfall acting through the exposed soil surrounding that which was purposely protected for the experiment.

To summarize the more important results of the work, it is shown that the retarding influence on the germination of seeds, evidenced by heated soils, is gradually reduced when these are exposed, moist, to the air, even when bacterial action is not possible; but that this is not the case when they are kept moist in the absence of air. This would indicate that the destruction of the poisonous substance is due to oxidation. Secondly, that toxic matter of the kind found in quantity in heated soil appears to be present in all soils, but that its amount in those which have not been heated is so small that it is soon oxidized. Lastly, air-dried soils, whether they have been heated or not, suffer a reduction in soluble constituents, and in toxic substances where these were originally present, after being kept for some months—a reduction closely similar to that shown by moist soils kept in air for about ten days.

SUGAR-CANE YIELDS AND DISTANCES OF PLANTING.

The following account of experiments dealing with the relationship between yields of sugar-cane and distances of planting, carried out at the Porto Rico Agricultural Experiment Station, is given in the *Porto Rico Horticultural News*, for August and October 1910:—

In distance of planting cane, the prime object is to obtain the greatest amount in a given area and with least cost. A series of experiments was carried out with a total of eighty-one plots of $\frac{1}{20}$-acre each, for the purpose of determining the amounts of cane produced when planted 10 by 10 feet, $7\frac{1}{2}$ by $7\frac{1}{2}$ feet, and 5 by 5 feet. The plantings were made in series of three plots each adjoining each other. The preparation was the same in each case and the cultivation similar, as far as the nature of the planting would permit. The wide planting necessarily permitted of longer cultivation than the narrow planting, not only with ploughs but also with hoes. In estimating the results, it should be borne in mind that the wider the planting the greater the expense necessary in bringing the crop to maturity. This is by reason of the fact that grass and weeds grow longer in wider plantings than in the narrow ones where the ground is sooner shaded. The following table shows the results for two years. Each instance represents the average amount of cane grown on twenty-seven plots:—

	Distance, feet.	Yield per acre, tons.
Plants	10 by 10	32·4
	$7\frac{1}{2}$ by $7\frac{1}{2}$	37·0
	5 by 5	40·7
Ratoons	10 by 10	26·0
	$7\frac{1}{2}$ by $7\frac{1}{2}$	30·9
	5 by 5	33·3
Total for two years	10 by 10	58·4
	$7\frac{1}{2}$ by $7\frac{1}{2}$	67·9
	5 by 5	74·0

It will be seen that in every instance the narrow planting gave the largest yield, not only for the plant canes, but for the ratoons.

The following table shows the results of close and wide planting, where different amounts of manures were applied:—

	10 by 10 feet. lb.	$7\frac{1}{2}$ by $7\frac{1}{2}$ feet. lb.	5 by 5 feet. lb.
Heavy manuring:—			
Plants ...	33,230	39,580	46,025
Ratoons ...	19,750	28,050	33,765
Medium manuring:—			
Plants ...	30,475	32,145	36,875
Ratoons ...	24,260	30,225	33,580
Light manuring:—			
Plants ..	23,775	28,225	26,990
No manuring:—			
Ratoons ...	26,230	25,120	22,520

The cane plant has a comparatively small root system for the heavy growth above ground. The roots are very much in a bunch below the plant, and provided there is abundant plant food present, they do not extend very far. Our results show that close planting is more profitable, not only in giving large yields of cane but economy in cultivation. The more the ground is shaded, the less tendency there is for the grass and weeds to grow.

The differences in the yield in wide and narrow planting are greater where heavy manuring is practised. The more abundant the plant food is in the soil, the closer the cane should be planted. When the plant food is deficient, the cane plant must have a wider range for its roots in order to obtain the elements necessary for its growth. The results of eighty-one plots in this experiment indicate strongly that, in Porto Rico, in order to obtain the greatest profit, we should plant close and fertilize heavily.

At the Cuba Experiment Station a number of experiments were carried on by F. S. Earle (Estación Central Agronomica, Cuba, Bulletin 2) on distance of planting. The usual system there is to plant in drills about 3 feet apart, with a distance of $4\frac{1}{2}$ to 5 feet between the rows. The soil is prepared and cultivated the first season, but no further tillage is given. In the so-called Zayas system, wider planting is followed, usually 9 by 12 feet, and continuous cultivation is given throughout the year with modern implements. Stable manure is used, but no commercial fertilizers are applied under this system; and when harvesting, all canes that are not ripe are allowed to remain for continued growth. The Zayas system proved to be more costly and to give a smaller crop than the usual method of planting. Also, leaving the unripened canes proved unsatisfactory. Results obtained by cane planters in other parts of Cuba showed that the Zayas system does not always give as good a yield the first year as the usual system. Some of this is due to injuries to the roots caused by continuous cultivation.

At the Queensland Sugar Station (*Annual Report of the Bureau of Queensland Sugar Experiment Stations*, 1905-6, p. 29), cane from rows planted 4 feet apart gave 20 tons per acre more than cane from rows 7 feet apart. This difference was gradual between these two distances. The wider the rows apart, the lower the yield. The cane from rows 4 feet apart gave $11\frac{1}{4}$ tons of sugar per acre, while the cane from the rows 7 feet apart gave 9 tons.

The World's Supply of Cotton.—It appears from figures submitted by Messrs. Neill Bros. that whereas last cotton season began with a total supply of cotton (visible and at the mills) of 3,199,000 bales, this season begins with only 1,741,000 bales. The difference between these two quantities represents the excess of consumption over current supply during the past twelve months, and indicates the need for an early and large supply of cotton from America this season. The consumption would, of course, have been greater if the use of cotton in the past year had not been restricted by its dearness; but the actual consumption exceeded 12,000,000 bales, and a crop of 14,000,000 bales this year would do no more than restore stocks to their normal level. But there is no prospect of any such yield. It is too soon to speak with confidence as to what the yield is likely to be, but no one looks for a record crop, and it is safe to assume that the price of cotton will remain high. Last season's American cotton crop was 10,610,000 bales. It is noteworthy that the exports to Great Britain—2,430,000 bales—were smaller than any during the past ten seasons, and that the Continent took less than for many years past. Of the total of the crop, American spinners took no less than 42 per cent., Great Britain 23 per cent., France 8 per cent., and the rest of the Continent 26 per cent. (*Journal of the Royal Society of Arts*, September 16, 1910.)

FRUITS AND FRUIT TREES.

THE BANANA COMMISSION OF BRITISH GUIANA.

The following report of the Commission appointed by His Excellency the Governor of British Guiana to consider the question of growing bananas in quantity in that colony, and the possibility of establishing an export trade in that fruit, is taken from the Demerara *Daily Chronicle*, Mail Edition, for November 11, 1910:—

We, the Commissioners appointed by Your Excellency to inquire into the question of the cultivation of bananas in this colony, and of the possibility of establishing an export trade in the product, do respectfully submit to Your Excellency this our report.

Your Commissioners have held three meetings, and a delegation of your Commissioners has visited Surinam and studied the banana industry there existing.

Before the Commission assembled, a careful study was made of all available documents and records relating to the Commission which reported on the subject in 1890 and 1895. It was evident from these that the Commission had no reliable evidence before it as to the feasibility of the cultivation of bananas on a commercial scale on the front lands of this colony, or any data from countries where bananas had been so cultivated, under similar conditions of soils and climate.

It was therefore decided that, as a banana industry had been started in Surinam, and was reported to be progressing satisfactorily, the most reliable way of ascertaining whether a similar industry could be established and carried on in this colony on commercially and financially sound lines, would be by a delegation of your Commissioners visiting that country, studying the cultural conditions under which the industry had been established and was being carried on, and making special inquiries as to the financial aspects of the enterprise in all their branches, and that decisions as to future proceedings, if any, should be made after the delegation had reported the results of the inquiry to your Commissioners.

The Combined Court, at its Annual Session in February, 1910, voted the funds requisite to allow of the visit being made, and your Government having communicated with the Government of Surinam, and having received from the Governor of that colony His Excellency's assurances of his cordial welcome of the delegates to that colony, and of his assistance and that of his officers in every way in their power to aid the delegates in acquiring full information as to the conditions under which the banana industry is there carried on, the delegation, consisting of the Chairman, Mr. J. Wood Davis, F.R., and Mr. F. A. Stockdale, arrived in Surinam on June 17, and after completing its inquiries, left Paramaribo on its return to Georgetown on July 1.

The results of the visit of the delegation to Surinam and the conclusions arrived at by the delegates were communicated to, and carefully considered by, your Commissioners. The report of the delegation to your Commissioners is appended.

Your Commissioners agree with the conclusions of their delegation as detailed in its report. Experience in Surinam with the banana industry, practically established there and financed by the Government of Holland, does not justify your Commissioners in recommending to Your Excellency that any steps should be taken by the Government of British Guiana with the object of starting the cultivation of bananas in this colony and of establishing an export trade in the product, while the facts detailed in the report of the delegates to Surinam lead to the conclusion that there is not any hope of, or inducement for, the establishment of such an industry in British Guiana either at present or in the near future.

All of which is respectfully submitted to Your Excellency:—J. B. Harrison, Chairman; W. J. Robson, G. Garnett, Francis Dias, J. Wood Davis, F.R., J. Sydney McArthur, F.R., F. A. Stockdale, John Junor, J. McFarlane Corry, T. Earle.

The report of the delegation to Surinam appears as an annex to the principal report.

THE DELEGATION TO SURINAM. SUMMARY AND CONCLUSIONS. The delegation that visited Surinam having described the industry in the Dutch colony report:—

In conclusion we had to satisfy ourselves whether a banana industry similar to the one in Surinam could be established in this colony, or whether we could entertain hopes, after our experience in the former country, for a successful industry here. The following are the more salient points in this connexion:—

We are fully satisfied that the major part of the readily available front lands of this colony is not well suited for the production of bananas on the commercial scale; that it is quite hopeless to look for their production on such a scale on the wind-swept abandoned lands of the present sugar estates and of earlier cultivations; and that the great area of land other-

wise well suited for banana cultivation, which lies at distances of from 10 to 30 miles from the coast-line cannot be successfully developed for such purposes in the manner similarly situated land is being so cultivated in Surinam. As already pointed out, no part of this colony possesses the exceptional shipping advantages the banana lands of Surinam enjoy.

Those in control of banana plantations would have to allow themselves not alone to be guided, but to be autocratically directed and controlled, by the agent of the purchasing company. This, we are certain that, unless under stress of conditions that have not yet occurred in this colony, the planters and farmers of British Guiana would never consent to.

A banana industry, as has been conclusively proved in Surinam, can only be carried on where efficient labour is available and under complete control, and the establishment of such an industry here would inevitably require extension, according to its scale, of East Indian immigration.

Banana planters would be completely at the mercy of the United Fruit Company and their purchasing agencies. The experience of Surinam with the Gros Michel variety of bananas, and the fact that the Panama disease is not unknown in British Guiana, show that they would be compelled to fall back on the cultivation of the Congo variety. The United Fruit Company have the monopoly of supplies of suckers of that kind.

At the outset, we approached the Surinam manager of the United Fruit Company as to whether his Company would be prepared to accept bananas from British Guiana, and were informed that on receipt of letters in May from this delegation in regard to our projected visit he had written his principals in New York who had cabled and subsequently written that the United Fruit Company was not prepared to consider or to undertake any more contracts for bananas, as the demand during the past few years had not been increasing at the same rate as had the supply. The United Fruit Company owned large areas of land in Costa Rica and other Central American Republics, and we were informed by their Surinam manager, that if any extension of land under banana cultivation was required, the Company would rather extend upon their own lands than make contracts with any other country or association. That this extension was not likely to take place was impressed upon us, and we were informed that the Company had lately changed very large areas of land which they own in Cuba from banana cultivation to that of sugar-cane.

We next enquired, as fully as possible, into the operations of the United Fruit Company with a view to ascertaining whether it would be possible to commence the shipment of bananas independently of that Company. So impressed were we by the perfectly organized business system of the United Fruit Company for obtaining their bananas, placing them upon the market, and meeting any rival banana shipments, that we are firmly convinced that it would be impossible for this colony to compete against them by an independently established industry. They practically hold a monopoly of the banana industry, handling most of the bananas that find their way into the American and Canadian markets, and controlling practically all the Gros Michel bananas that go to the United Kingdom and other European countries. Apart from the consideration of whether bananas could be grown satisfactorily in this colony, it was patent to us that without a contract with the United Fruit Company it would not be possible to market satisfactorily any bananas that we might produce, and that they were not prepared to offer us any hope that such a contract would be entered into. In fact such a contract would be, as we have already indicated, in direct opposition to the carefully thought out and deliberately adopted policy of the United Fruit Company.

The delegation therefore is unable, in the face of the results of the investigations which have led them to the above conclusions, to offer to the Commission either any hope of, or any inducement for, the establishment of a banana industry in British Guiana either at the present time or in the near future.—J. B. Harrison, J. Wood Davis, F. A. Stockdale.

OBSERVATIONS ON WILD LEGUMINOUS PLANTS.

In the *Agricultural News*, Vol. VIII, p. 391, extracts were given from Circular No. 31 of the Bureau of Plant Industry of the United States Department of Agriculture, in which observations made in connexion with the growth and distribution of wild leguminous plants are described. Since the publication of this circular, a second one has been issued, which presents a continuation of the observations described in the first. This is Circular No. 70 of the same Bureau, from which, in view of their general interest, the following extracts are taken:—

In 1909, frequent examinations were made to determine whether all the native legumes were nitrogen-gathering. Practically all the prairie species of the region have been examined, and nodules have been found in abundance on every one, although they seem to be much more abundant on some species than on others. In some cases no nodules were found on some individuals, but this was probably due to the difficulty in removing the roots from the soil, rather than to lack of nodules.

In general, there seems to be many more nodules on annuals, in proportion to the size of the root, than on perennials. As to the relative quantities of nitrogen gathered by annuals and perennials, no data have yet been obtained. Some co-operative work on this line has been begun, but it has not gone far enough for a report. Some co-operative work was also attempted in reference to cross-inoculation, to determine whether the native legumes are capable of inoculating the soil for clover and alfalfa. This work failed because of bad conditions in the greenhouse. There is no doubt in the writer's mind that several of the native legumes are capable of inoculating our cultivated ones.

Referring to the special habitat of the chief among the legumes, the circular states:—

The counts in the ditch by the railroad are in marked contrast to those on the adjoining prairie. These shallow ditches were lines of white for miles, all filled with silver-leaved Psoralea. Whether the dominance of Psoralea in the ditches is due to additional moisture or to the destruction of the grasses, it is impossible to say. There is some evidence, however, that the abundance of these legumes in the ditches is due to the destruction of the grass and the removal of the soil, exposing the subsoil, which contains less nitrogen, and so is less favourable to the growth of non-leguminous plants. In many places on the level land, where the grass has been killed by stock, stacks, or breaking, Psoralea has come in thickly. In nearly all the short-grass country, except where *Vicia linearis* is encountered, the number of legumes is much less than in the long-grass country; but on the slopes where the soil is poor, and buffalo grass and grama grass do not thrive, legumes are plentiful. This suggests that it may be more the struggle with the grasses than with drought that keeps down the legumes.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 7, with reference to the sales of West Indian Sea Island cotton :—

There has been no business reported since our last report in West Indian Sea Island cotton.

Florida and Carolina Sea Islands remain firm in price, with a limited business doing.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 5, is as follows:—

There was some demand in the market this week, enabling factors to obtain their asking prices for 400 bales of their offerings of about 1,000 bales. The sales consisted of 100 bales Fully Fine at 38c., and 300 bales Extra Fine at 40c. and 41c. As the demand was chiefly for the Extra Fine, and exceeded the offerings on the market, the 41c. was paid for 100 bales, to enable the buyer to secure the cotton over the other bids in the market.

The present demand being seemingly satisfied, the market closed quiet, and should it continue so, these prices may not be maintained; but this demand has encouraged factors in their views, and they are continuing to hold: Extra Fine at 41c., = $22\frac{1}{2}d.$; Fully Fine at 38c., = $21d.$; Fine at 36c., = $20d.$

USE AND MANUFACTURE OF EGYPTIAN COTTON.

An interesting article in the *Journal of the Royal Society of Arts*, for October 15, 1910, gives an account of the main facts relating to Egyptian cotton. It points out, first of all, that the possibilities of cotton as a crop for Egypt were originally recognized by the French engineer, Jumel, who succeeded in interesting Mohamet Ali in the matter, with the result that quantities of cotton seed were imported into Egypt. Attention is drawn to the fact that Egyptian cotton has always been noted for its high quality, being surpassed only by Sea Island, Georgia and West Indian Sea Island.

Proceeding, the article points out that the charcteristics of Egyptian cotton are length and strength of lint, fine soft quality, silky lustre, and a brown colour in certain varieties. Like Sea Island cotton, it is used for making many articles in which strength, with fineness, is required; among these are typewriter ribbons, aeroplane cloths, sewing cotton and mail bags. Brown Egyptian cotton is employed for the manufacture of ecru lace curtains and Balbriggan underwear. It is especially useful for mixing with silk, and for filling sateen, Indian linen, and similar goods, which possess a brilliant surface, on account of its clearness and the ease with which it takes dyes.

A broad description of the manufacture of cotton shows it to be divided into three processes, namely spinning, weaving and finishing. The first of these includes successively cleaning; combing or carding, which makes the fibres parallel to one another, and removes the short ones; and spinning proper, by which the cotton is finally drawn out to the required fineness or 'count', and made into yarn. It is in the carding that Egyptian cotton has always received special treatment, for this is necessary in order that the yarn may be fine, strong and uniform.

When the mercerising process was reintroduced, the prices of Egyptian cotton were raised, owing to the increase in the demand for the goods made from it. The process consists in treating the yarn with a warm solution of caustic soda, and preventing it from shrinking when drying by stretching it slightly while this is being done. A large amount of the superiority of Egyptian cotton has been derived from the fact that it gives a product superior to that from American cotton, when it is mercerised. The invention, however, of a new process known as 'schreinerising' is likely to take away this point of superiority, as this can be applied to Egyptian and American cotton with equal success. It consists in passing the manufactured material between heated steel rollers, having the surface cut diagonally with fine parallel lines, with the result that the material gains the appearance of satin.

A table is given in the article by which it is shown, that as is well known, the exports of cotton from Egypt have been decreasing. In 1907-8, these amounted to 908,364 bales; in 1908-9, to 897,026; and in 1909-10 to 672,608 bales. The table is followed by a short discussion of the causes for this diminution of output. These are sufficiently familar to those interested in cotton to make it unnecessary for any description of them to be given at present. (For recent information in regard to this matter, see *Agricultural News*, Vol. IX pp. 326 and 342.)

As regards Egypt, the article concludes by stating that a special Cotton Commission has recently had under consideration remedies for the declining production of the crop. It is pointed out by this Commission that the drainage system of the country has not kept pace with the irrigation system, and the importance is emphasized of the necessity for obtaining information as to the manurial requirements of the crop, and as to the best means of selecting seed. Among the measures suggested in order that this may be brought about are the foundation of an agronomic station at Cairo and the declaration is made that the establishment of an agricultural department for Egypt is absolutely essential.

AGRICULTURAL PROSPECTS IN PANAMA.

The following information concerning some of the agricultural resources and industries of Panama is taken from *Diplomatic and Consular Reports*, No. 4571 Annual Series:—

NATURAL RESOURCES. The development of the country's natural resources is a subject to which much attention is being given, as it is recognized that, as the labour employed is withdrawn from the canal, the economic condition of the country will suffer a radical and adverse change, unless in the meantime increased production from the soil takes place, to compensate for the cessation of the wages stream from the United States to pay for constructing the canal. The Republic of Panama would appear to offer many advantages as a field for investment. Its freedom from revolutions and internal disturbances is assured by the interests of the United States in the canal; it has a stable currency, and large areas suitable, from climate and soil, for the cultivation of nearly all tropical products and for cattle-raising, and is said to possess rich mineral and forest wealth. On the other hand, there is a scarcity of native labour, and the standard rate of wages for common labour paid by the Canal Commission, viz., about 4*s*. a day, is higher than that which could be paid by other employers. Other disadvantages are the difficulty of obtaining a secure title to land, and the absence of means of communication and transportation. It is thus evident that the opportunities for settlement on a small scale are limited, and that it is to enterprises which will invest a large amount of capital in machinery, roads and the importation of labour that the country must look for profitable development. The Government is keenly alive to the necessity of furthering agricultural and mining development, and is ready to welcome and facilitate the introduction of foreign capital.

CATTLE-RAISING. Cattle-raising is the principal industry of the country, and the animals are all sent to Panama to be killed for consumption. It is often recommended that pedigree animals from abroad should be introduced to improve the local stock, and the improvement in Argentine stock by the introduction of British breeds is pointed to, but few cattle-raisers are affluent or far-sighted enough to follow this course. In 1906, the sum of £2,000 was voted by the National Assembly for the introduction of foreign pedigree stock. The stock bought was sold at public auction, and the money used to procure more. At present about £800 is in hand for the purpose. In connexion with the proposed agricultural experimental station, it has been suggested that the Government should import high-class animals from abroad and allow stock-owners their services against a nominal fee. An agricultural fair, the first to be held in the country, will be held in 1911 at Anton, a town with a population of about 5,500.

TIMBER RESOURCES.—An American company is making preparations to develop the timber resources of the Bayano River district. It has secured some 70,000 acres on the Pacific side of the Cordillera Divide, to which easy access is given by the Bayano River, the mouth of which is some 28 miles east of the city of Panama. The company has surveyed their property, fixed a site for a sawmill town, and a double-band sawmill of 75,000 feet daily capacity in hardwoods with the necessary machinery, has been shipped from the United States, and is now awaiting transportation to the site. The most important and extensive of the hardwoods is the espave, and next to that the Spanish cedar. It has not yet been established whether the native timbers can be cured for lumber purposes locally, or whether artificial drying will have to be resorted to.

COCOA-NUTS. The export of cocoa-nuts is growing, and will probably continue to form one of the country's staple exports. The nuts are at present collected only on the Atlantic coast, but there is no reason why their cultivation should not be developed on the Pacific coast also. The cocoa-nuts grow principally on the San Blas coast, about 180 miles east of Colon, and are shipped to New York and Philadelphia, where they are shelled by machinery. The production of copra has not so far attained any importance, as the nuts are of more value for confectionery and other edible purposes, but cocoa-nut oil is made by the natives for cooking purposes.

AGRICULTURAL EXAMINATIONS.

The third Preliminary Examination, in connexion with the scheme of Courses of Reading established by the Imperial Department of Agriculture, was held on October 10, in Antigua, Barbados, Dominica, Grenada, St. Lucia and Montserrat, and on October 17, in St. Kitts. Seventeen candidates, altogether, presented themselves for examination: three in Antigua, four in Barbados, one in Dominica, two in Grenada, four in St. Kitts, two in St. Lucia and one in Montserrat. Of the whole number, four failed to satisfy the examiners.

The names of the successful candidates are as follows:—

FIRST CLASS.	SECOND CLASS.
C. A. Gomes (Antigua)	W. H. Hagley (Grenada)
C. A. Field (Barbados)	A. L. Stamers (Antigua)
E. H. Barrow (Barbados)	G. A. Thomas (St. Lucia)
	P. Webster (St. Kitts)
	S. W. Howes (Montserrat)
	A. L. Woodley (St. Kitts)

THIRD CLASS.

D. O. Cleghorn (St. Kitts)
B. F. Cuffy (Dominica)
B. N. Monrose (St. Lucia)
M. S. Goodman (Barbados)

The oral examination in the different islands was conducted by:—

Mr. V. M. Weil, B.Sc. ,, T. Jackson	Antigua
,, J. R. Bovell, I.S.O., F.L.S., F.C.S. Dr. Longfield Smith	Barbados
Mr. J. Jones ,, G. A. Jones	Dominica
,, G. G. Auchinleck, B.Sc. ,, J. Harbin	Grenada
,, W. Robson ,, J. I. C. Howard, B.A.	Montserrat
,, F. R. Shepherd ,, W. R. Dunlop	St. Kitts
,, J. C. Moore ,, C. F. Condell, B.A.	St. Lucia

A proclamation contained in the Grenada *Government Gazette* for October 15, 1910, shows that the Forestry Ordinance, 1906, Grenada, will come into operation, and have the force and effect of law, on and from the first day of December 1910. The purpose of the Ordinance is to protect and conserve the forest and water sources of the colony.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in the present number is concerned with the most recent work that has been done in relation to The Action of Heat on Soils.

Pages 372 and 373 give information in connexion with the report that has been issued by the recent Banana Commission of British Guiana. This throws light on several questions in relation to the export of fruit from the West Indies.

An abstract of an interesting article that has appeared lately, on the use and manufacture of Egyptian cotton, is given on page 374.

On page 375 are presented the results of the recent preliminary examinations held in connexion with the Reading Courses of the Department.

The Insect Notes, on page 378, give an account of the recent introduction of the St. Vincent 'Jack Spaniard' into Montserrat, as well as a description of the cowpea curculio.

Reviews of two recent publications of interest to horticulturists and agriculturists are given on page 379.

Page 381 contains the Students' Corner, in which an opportunity has been taken to discuss the papers set at the recent Courses of Reading preliminary examinations.

The Fungus Notes, on page 382, are concerned with further observations on die-back diseases, and additional notes on the pink diseases of plants.

Work Under the Food and Drugs Ordinance, British Guiana, 1909-10.

The work under this Ordinance, for the half-year ended March 1910, is described in a series of official reports that has just been issued. Those relating to the colony show that the general rate of adulteration is 10·7 per cent., which, though higher than that of last year, is satisfactorily low. The rate of adulteration of milk in the colony was 13·1 per cent., which, as is stated by Professor Harrison, is higher than it should be; it is, in fact, greater than it has been for the past two years.

In special relation to the county of Demerara, it is shown that the number of samples received for analysis at the Government Laboratory, from the Police Department and the Town Superintendent, during the period, was 690; the percentage of these returned as adulterated was 10·3. This does not include the samples of milk, the number of which was 512. With regard to these, a percentage adulteration of 18·7 was found—the highest rate since 1907. The manner of adulteration, in fifteen cases, was extracting the fat by skimming, or by mixing butter-milk with genuine milk.

Nandi Rubber.

According to the *Kew Bulletin*, No. 8, 1910, dried specimens of a rubber vine (*Landolphia ugandensis*) have been received from the Nandi forests in British East Africa, together with information, an abstract of most of which may be given, as follows.

The plant is a liane, existing in considerable quantities in the Nandi forests, which are at an elevation of 6,000 to 7,000 feet. The elevation of these, combined with the presence of very humid conditions, makes the climate almost temperate. A matter of special interest is that the rubber from the plant is probably the only kind occurring naturally, in a climate that is not tropical, which can be obtained continuously.

The amount of rubber produced from the Nandi forests is, ordinarily, 7 tons yearly, having a value of about £2,000 at Mombassa; only about one-third of the vines are, however, being tapped at present. Various circumstances, such as shortening the time of rest for the vines, and the making of plantations, should increase this output to a considerable extent. The average yield of rubber from each plant is 1 oz.

Tapping is conducted by shaving off slices of bark, as far down as the cambium layer. The cuts are, however, often made too deep, causing the death of the tissue above and below them; making diagonal slits with a knife would probably be a better method. The latex has been coagulated with salt, by wetting the surface of the bark with salt water; by chewing, and by using the juice of a fruit called Noguk, or Nōkōk (probably *Flacourtia* sp.).

The plant yields an edible fruit which, itself, contains a large proportion of latex.

Cocoa-nut Cultivation and Copra in the Federated Malay States.

The Inspector of Cocoa-nut Plantations of the Federated Malay States reports that the area devoted to cocoa-nut-growing in the States during 1909 was estimated at about 123,815 acres. It is probable that about two-thirds of the trees are in bearing, and the value of the whole area is somewhere in the neighbourhood of 3 million pounds, sterling.

The increase in the acreage during 1909 was 6,618; of this area, 5,118 acres were planted by natives, and 1,500 by Europeans.

The exports of copra from the Federated Malay States amounted to 104,469 piculs (1 picul = $133\frac{1}{3}$ lb.); in 1909 and 1908 they were 71,981 and 49,326 piculs, respectively.

According to the *Board of Trade Journal* for September 29, 1910, from which these facts are taken, much of the work that is being carried on in connexion with the copra industry is directed toward giving information to the natives as to the proper method of collecting the nuts and making the copra. It is considered, broadly speaking, that progress is being made in the industry, and that there are signs of its further extension.

Creasote for Preserving Posts.

An account of an experiment which is being conducted in Antigua for the purpose of investigating the usefulness of creasote as a preservative for gate posts is contained in the *Agricultural News*, Vol. IX, p. 312, and in the Annual Report on the Botanic Station, etc. Antigua, for 1909-10. In relation to the employment of creasote for similar purposes, a report has been received, through the Colonial Secretary, Antigua, on the use of this preparation for preserving telephone posts; this was made by Mr. J. Mc. Donald, Superintendent of Telephones in that island.

According to the report, the Telephone Department of Antigua first employed creasote poles in 1896, since when a number has been imported every year, so that more than 1,000 are in use at the present time. In 1896 and 1897, 250 of the treated poles were erected in different parts of the island, and none of these have been renewed, all being quite sound, with a few exceptions, although they have been at least thirteen years in the ground. A few of the poles show signs of rot, but will last for some years yet, as this does not appear to affect them to any depth.

The observations have not been continued for a sufficient length of time to make it possible to give an opinion as to how many years creasoted poles will last. Of the whole number in the island, only four have been renewed so far, and these only after six to eight years of use. This is sufficient to demonstrate, in any case, that creasoted poles will last very much longer than untreated pitch pine poles, as the life of the latter is only from three to four years.

It is a matter of interest, in regard to cost, that the creasoted poles, ready tapered, are imported into Antigua at the price of $85 per 1,000 feet; this is a little more than twice the cost of the untreated poles.

A Labour-Saving Contrivance.

A description of a simple and cheap contrivance for carrying liquids short distances is contained in the *Journal of the Department of Agriculture of Victoria* for September 1910, p. 610. It consists of an ordinary barrel, fitted with an iron handle which is very similar to that of a garden roller. After being filled, the barrel with the liquid in it, is easily pulled or pushed by means of the handle, to the place where the liquid is required. In the special case that is described, it was used for conveying skim milk from the separator room to the piggery. The barrel, of course, needs to be provided with a vent, preferably on one side, near the rim.

Such a contrivance can easily be cleaned by means of hot water or steam. It may often be found of use on estates in the West Indies.

Agriculture in Sierra Leone.

Colonial Reports—Annual, No. 648, to which reference was made in the last number but one of the *Agricultural News* (p. 344), contains a section describing the progress of the agricultural development of Sierra Leone. It is stated that this has been, and still continues to be, much hampered by the absence of a properly organized agricultural department; although the efforts of the Government are succeeding in causing a greater interest to be taken in agriculture in the Colony and Protectorate.

Work on some of the experimental farms has proved to the natives that the practices of deep hoeing and rotation of crops will enable rice to be grown without letting the land lie fallow—the usual custom. It has not been followed by any change in the methods of the natives, and it is expected that some time will elapse before this is brought about.

Nurseries for rubber, cacao and gum copal have been established. The intention is to plant the rubber out in the forests covering the neighbouring hills, while plantations of cacao will be formed. Success is already being obtained with *Hevea brasiliensis* and *Funtumia elastica*.

Kola plantations have been established in certain districts, in which the efforts of the Government have been directed toward the prevention of the too close planting of the trees. The produce of these is shared equally between the natives and the Government, the portion belonging to the latter being employed for the purpose of extending the cultivation of kola in the district. The raising of kola seedlings is being encouraged by the granting of bonuses.

The area in which ginger is cultivated is increasing. There are indications that, as regards fruit, a trade with England might be established.

Progress is being made in the growing of ground nuts, maize, cacao, coffee and piassava. The attempts of the Government to increase the area of the cocoa-nut industry have failed, on account of the prejudice of the natives against planting more trees.

INSECT NOTES.

INTRODUCTION OF THE ST. VINCENT 'JACK SPANIARD' INTO MONTSERRAT.

It has been known for some time that the St. Vincent 'Jack Spaniard' (*Polistes annularis*) is of use in that island in reducing the numbers of the cotton worm (*Alabama* [Aletia] *argillacea*). Recent references to this matter are contained in the *West Indian Bulletin*, Vols. VIII, pp. 360 and 363; and IX, p. 211. The fact that the cotton worm has caused a large amount of trouble and loss in Montserrat (as indeed has been the case, from time to time, in the other islands in the West Indies where cotton is grown), and the circumstance that this insect is absent from that island, have caused the question of its introduction to be considered. Definite measures have been undertaken towards this, and the insect appears now to be established in Montserrat. Much of the matter that is contained in the following account is taken from reports on the work of introduction that have been received from Mr. W. H. Patterson, Officer-in-charge of the Agricultural School, St. Vincent, and from Mr. W. Robson, Curator of the Botanic Station, Montserrat.

Up to October 5, 1910, four consignments of the insect had been received in Montserrat, from St. Vincent. In the first two, pupae were sent; while in the last two, the insect was despatched in the larval stage. In the first case, the nests were simply fastened flat inside the boxes, and the top was covered with mosquito gauze. In the second, as the insects were in the larval stage, an arrangement was made by which the larvae were kept from falling out of their cells by means of rows of wire running from side to side through the boxes, and forming shelves, to which the nests were secured with soft twine; this gave a chance for the more advanced among them to pupate. The additional precaution was not required in the case of the pupae. Here, the pieces of comb containing sealed brood were fixed securely to the sides of the box by means of pieces of tape running through holes in the wood, and fastened on the outside.

All the consignments arrived in Montserrat in excellent condition. In the case of the first the box was removed, without being opened, to one of the open sheds at Grove Station, and fixed by one of its sides to a beam. When the wire gauze was removed, fifteen perfect insects were found to have hatched out, and the combs showed the presence of much unhatched, sealed brood. No immediate disposition to fly was shown by the adult insects; they appeared to be busily engaged in work on the comb. In a few days, the number had increased to fifty; and on August 24, new colonies were being made in different parts of the shed. By October 4, sealed brood was seen in the new combs. An observation of interest was that the shed in which the insects were liberated is quite open, and also that it contains a large number of nests of the local Jack Spaniard.

The second consignment was much larger than the first, and was found to contain about 150 adult insects, upon its arrival. It was placed in a large open shed at Dagenham, when the behaviour of the insects resembled closely that which was observed at Grove. At the time of reporting, twenty new combs had been formed, some of which contained sealed brood. The combs in which the insects were imported have been deserted, in the case of both consignments.

The third and fourth importations of the insect were sent to Bethel and Elberton; there are no observations to place on record concerning these. All the places where the introductions were made are centres of cotton-growing districts.

When the report was made, the cotton worm was only just beginning to appear in quantity in the field, so that nothing could be said as to any definite attacks on this pest by the imported insect.

A useful fact, in connexion with the exportation of this insect, is that a box measuring 15 inches, cube, will hold about 250 nests, each containing an average of fifteen sealed cells.

A final matter of interest is that, although Montserrat possesses a Jack Spaniard of its own, this is smaller and less striking in appearance than the species from St. Vincent.

THE COWPEA CURCULIO.

A bulletin (No. 85, part VIII) recently issued by the Bureau of Entomology of the United States Department of Agriculture, gives a very complete account of the cowpea curculio (*Chalcodermus aeneus*, Boh.). The following facts and suggestions are taken from this bulletin.

This insect is a small snout-beetle or weevil. The general colour is black with a bronze tinge, the wing covers and thorax being coarsely punctured. The insect is about $\frac{1}{4}$-inch in length, and is quite robust.

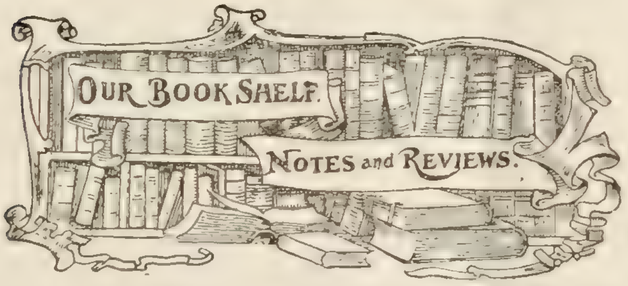
The eggs of the cowpea curculio are deposited in the pod or in the forming pea itself, in cavities made by the female beetle by means of the mandibles. The larvae feed inside the pea, or sometimes between the pea and the pod, and when full grown they leave the pod to enter the ground for pupation.

The insect is said to be a native of Mexico and the Southern United States. It is a serious pest in certain localities within its range, where cowpeas are largely grown in rotation with cotton, for not only is a considerable amount of damage done to the cowpeas, but the succeeding crop of cotton may be seriously damaged, or destroyed, by the hibernated beetles. Cotton is not a regular food plant for this insect, but when it happens that cotton seedlings are available in fields where large numbers of the cowpea curculio have hibernated since the cowpea crop of the previous season, it is forced to eat cotton, as the only available food.

The curculio does not appear to have been recorded as a pest of cowpeas or cotton in the West Indies, and its habit of leaving the pod to pupate before the seeds are fully ripe would seem to render its introduction, in or with seed for planting, less likely than would be the case with such a pest as the bean and pea weevils (*Bruchus* sp.), which pupate within the seed. The latter are often transported long distances in seed for planting, and cause enormous damage while the seed is in storage or in transportation.

The regulations which exist in all the West Indian islands for dealing with imported plants should be sufficient to prevent any chance introduction of the cowpea curculio, along with seeds. The pea and bean weevils occur in the West Indies, but repeated introductions may now be prevented by careful fumigation with carbon bisulphide, on the importation of seeds.

If the cowpea curculio should be found to exist in a field of cowpeas, a remedy would be obtained in picking all the early pods before they were quite ripe. These would probably contain the eggs from all the beetles, and the later pods would be free from attack. It would also be well not to plant cotton on land which has just previously grown a crop of cowpeas, in which the curculio has occurred.



A HANDBOOK OF TROPICAL GARDENING AND PLANTING. By H. F. Macmillan, F.L.S., F.R.H.S. *H. W. Cave & Co., Amen Corner, Colombo, Ceylon.* 10*s.* 6*d.*

This book, which deals especially with the conditions surrounding gardening in Ceylon, is the work of the Curator of the Royal Botanic Gardens at Peradeniya, and this fact should be sufficient to arouse expectations as to its usefulness which, it may be said at once, are justified on its perusal. The matter with which it deals is contained in four sections. The first of these includes nine chapters, of which six are concerned with the life-history of garden plants, especially in relation to their surroundings and propagation; the last three chapters in the section deal more particularly with the cultivation of such plants for special purposes, and with the implements that are employed in this. The five chapters of the second section give an account of tropical and sub-tropical fruits and vegetables as well as spices of the tropics, condiments and seasoning herbs. Chapters XV to XXI form the substance of Section III, which gives an account of plants of special kinds, and for particular situations, whether for use or for ornament. The remaining chapters, of which there are eleven, constitute Section IV. The first two of these deal with the standard and minor products of Ceylon; miscellaneous garden plants, perfume-yielding plants and others which are useful such as pasture, grazing and fodder plants, receive attention in the next three chapters. These are followed by a similar number of chapters, which treat of the enemies and friends of the garden and estate, the former including noxious weeds, insect and other animal pests, and fungus diseases. Finally, three chapters are devoted to the transport, packing and storing of planting material; various statistics for practical work; recipes for jams, jellies, etc.; and calendars of garden work for various parts of Ceylon.

In a more detailed way, it may be said that Chapters I to III, dealing with climate, soils, plant life and manures, present the necessary facts in a concise and handy form. Chapter IV contains particularly useful information regarding green manures; while Chapter VI, which is more detailed in the information it gives, is a well-illustrated account of the different modes of the propagation of plants. The cultural operations employed in gardens are necessarily treated without too great detail, in Chapter VII; while the two succeeding ones contain information about general gardening work that is particularly useful to the practical gardener.

In Chapters X to XXVI, an account is presented of individual kinds of plants in their relation to their particular purposes. The mode of treatment is thorough, especially in regard to the number of species concerning which facts are given, and there is much that is of interest from a purely botanical standpoint. Unfortunately, however, the presentation of the matter is somewhat marred through the existence of several typographical errors in the names of plants. Chapter XXVII, dealing with the enemies and friends of the garden, is particularly valuable because of the good account of methods for the destruction of weeds which it contains. In that dealing with the insect pests, more particularly (Chapter XXVIII), a noticeable feature is that it contains a good list of insecticides. A final matter of more special comment is that the calendars of work in the garden, in Chapter XXXII, have been made to apply thoroughly to the conditions in different parts of Ceylon, and should be particularly useful in their definite connexions.

The work, which contains about 530 pages and more than 150 illustrations, is produced in an attractive and useful manner, and the illustrations are generally good, throughout. It is rather large in size, however, to be classed as a handbook, and it seems that the practical gardener, in his everyday work would find it of much use if he could be provided with a smaller, abridged edition containing the matter in Section I, and Chapters XXVII to XXX and XXXII. Copies of this would be used directly for his outside work, while a copy of the original edition would be kept on the shelf, for reference.

THE SCIENCE AND PRACTICE OF MANURING. By W. Dyke, F.R.H.S. *The Lockwood Press, 1 Mitre Court, Fleet Street, London.* 1*s.*

A copy of a handy booklet, with the above title, has been received recently. This contains a large amount of useful information in regard to manures, presented in a condensed form, and in a manner easy for reference. In twelve short chapters, particulars are given concerning, firstly, general matters relating to manures, plants, crops and soils; facts for the guidance of those who are growing plants, as well as descriptions of the manures that are commonly in use; the use of manures in connexion with the raising of plants of special kinds; and finally, several useful hints in relation to the employment of manures.

It is of interest to note that the pamphlet does not contain a mere description of manures, with instructions for their application, as might have been expected. After giving interesting facts concerning the origin and history of them, it deals with the needs of plants, more especially in regard to the supply of these from the soil, and treats of the ways in which they are affected, either beneficially or adversely, through manuring The matters considered are illustrated by very simple examples, which serve their purpose, as far as is required.

Proceeding further with the manner of presentation of the facts with which the pamphlet has been designed to deal, it is noticeable that the scope of the information given is a reasonable one; there is no attempt to go deeply into subjects which are of comparative unimportance, in the special connexion; the effort is rather to give elementary knowledge that will be of use to all who take part in the employment of manures. To show that the subject is not approached from a narrow standpoint, it may be stated that a chapter is given which deals with the influence of soils on manuring—a subject which is sometimes neglected by agriculturists, when the best and most suitable methods of manuring are under consideration.

The six chapters that deal in a more definite way with manures and their particular mode of application give information that is naturally of more special use in temperate countries than in the tropics. They contain facts, nevertheless, that should be known to the grower of plants, in every part of the world.

Among other matters, the last chapter contains a series of warnings to those by whom manures are commonly employed. These form a particularly useful part of an interesting booklet, which might well be in the possession of all those who require the presentation of the commoner facts concerning manures, in a compact form.

GLEANINGS.

Cotton picking in St. Vincent is being actively done, and the Central Cotton Ginnery was opened, to receive seed cotton, on the first of this month.

It is reported from St. Kitts that the sugar-cane is growing well, since the receipt of good rains. As regards cotton picking, satisfactory returns have been received so far.

The series of articles on the goats of Barbados, which appeared in the *Barbados Standard* during the months of April to November 1910, have been published in book form, with illustrations from blocks in the possession of the Imperial Department of Agriculture.

The distribution of plants from the Dominica Botanic Station during last month included the following: limes 2,800 Para rubber 610, cacao seedlings 325, grafted cacao 18, vanilla 300. The total distribution for the month was 4,086 plants.

The condition of the sugar-cane crop in Antigua is stated not to be promising, generally, but good yields are expected on a few estates. The distribution from the Antigua Botanic Station during October included 3,882 plants and 10,000 cuttings, most of the latter being sugar-cane.

It is stated, on the authority of the Belgian Legation at Caracas, that the coming cotton crop of Venezuela will be less than that of last year, being 600,000 sacks (1 sack = 62 kilos.), instead of 700,000 sacks. The reason for the lower yield is given as the sudden arrival of the spring rains, as well as drought during the fruiting time.

Arrangements have been made for Dominica to participate in the London Fruit Exhibition, 1910, to be held from December 1 to 3 next. They are in the hands of the Permanent Exhibition Committee, and exhibits which were entrusted to the care of this Committee left Dominica by Royal Mail Steamer on November 13.

A consular report shows that the cotton crop of Hayti, last year, amounted to 3,615,972 lb. Nearly all of this was sent to Europe, as the merchants are of opinion that they can get better prices there than in the United States. The area under cotton in the Republic becomes larger every year, and the prospects of the cotton-growing industry are good.

The most recent reports concerning the cotton industry in Montserrat state that the crop has matured early, and that most of it will be reaped before the end of December. Attacks by the cotton worm and a certain amount of boll dropping have taken place, but there was no evidence of the presence of the flower-bud maggot at the time of reporting.

An Ordinance to be cited as The Uganda Cotton (Amendment) Ordinance, 1910, has been made recently in that Protectorate. This is to be read as one with the Uganda Cotton Ordinance, 1908. Its special purpose is to give the Governor the power to make rules controlling the purchase and sale of raw cotton, in addition to the power to make rules, contained in the Ordinance of 1908.

The British Acting Vice-Consul at Hakodate reports that a wide area in the north-eastern part of Japanese Sakhalin is 'tundra', covered with moss or lichen to a depth of many feet. A concession for the use of this moss has been granted by the Government to a Japanese merchant, who proposes to erect a mill and to manufacture pulp for paper-making. (The *Board of Trade Journal*, September 15, 1910.)

With reference to the announcement on page 364 of the last number of the *Agricultural News*, to the effect that proclamations in connexion with the regulation of the importation of plants or material, for planting purposes, had been made recently in Antigua and Dominica, it should be stated that a similar proclamation was made in St. Lucia, on October 28, 1910, under the third section of the Plants Protection Ordinance, 1909, of that colony.

The *Annals of Tropical Medicine and Parasitology*, Vol. IV, No. 2, contains a paper dealing with the factors in the transmission and prevention of malaria in the Panama Canal Zone. The investigations which are described showed that the mosquitos *Cellia albimana* and *C. tarsimaculata* were the most efficient transmitters of malaria; while it was found impossible to infect *Arribalzagia malefactor* with the disease. (From *Nature*, September 29, 1910.)

A statement appeared in a recent number of the *Agricultural News* (No. 220, p. 306), to the effect that the Thwaite System of Electro-Culture is under trial at the Royal Botanic Gardens, Kew. Information has been since received, through the courtesy of the Director of the Royal Botanic Gardens, that this is not the case; but that an installation of the system has been fitted up at the Gardens of the Royal Botanic Society, Regent's Park, London.

The Board of Agriculture of Great Britain has issued a new order in connexion with anthrax, for the purpose of obtaining more trustworthy statistics, so that more effective legislation may be made in regard to this disease. It enables the veterinary officers of the Board to examine the evidence submitted, in connexion with the disease, to the local authorites, as well as to carry out experimental investigations on their own part, before a decision is made as to the real outbreak causing the disease.

The results of chemical analysis and of determinations of the water capacity of composite samples of soils from the sugar districts of Queensland are reported in the *Annual Report of the Bureau of Sugar Experiment Stations*, Queensland, for 1909. As a result of a comparison of the solvent action of 1 per cent. solutions of aspartic, acetic, citric and hydrochloric acids, the author states: 'Maxwell's aspartic acid method is considered the most useful, and the one which approximates most closely in showing the amount of the necessary elements available for cane crops.' (*Experiment Station Record*, August 1910, p. 120.)

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The results of the recent Preliminary Examinations held in connexion with the Courses of Reading of the Imperial Department of Agriculture, in Antigua, Barbados, Dominica, Grenada, Montserrat, St. Kitts and St. Lucia, appear on another page of this issue of the *Agricultural News*. It will be well to give consideration to the questions that were set, at all the centres save one, in the written part of the examination.

The number of questions in this part was thirteen; of these not more than nine were to be attempted by the candidates. The questions were as follows:—(1) Give an outline of the ways in which green plants are dependent upon gases in the atmosphere. (2) Describe broadly the composition of the chief kinds of soil, showing how their physical properties depend upon the proportions of their principal constituents. (3) Write a description, with diagrams, of the germination of the seed of one kind of plant belonging to each of the following classes: (a) a garden crop; (b) a general crop; (c) a permanent crop. (4) Describe any form of cultivator with which you are acquainted, stating in what connexions it may be used more particularly. (5) What are the chief precautions required in keeping farmyard manure, and why are they necessary? Give an account of any artificial manure that is employed for the purpose of supplying nitrogen. (6) Why is the grafting of plants often practised? Write a description, with sketches, of any kind of grafting with which you are familiar. (7) Compare the aerial stem of the sugar-cane with that of a dicotyledon, such as cotton. (8) Give a description of the flower of a dicotyledon, stating the uses of its different parts. (9) What methods of cultivation are employed in connexion with the principal crop in the district in which you live? What are the uses of cultivation to the plants for which it is practised? (10) Describe either (a) the skeleton of the horse, or (b) the digestive system of the cow, showing how the one you deal with is suited to the work that is required of it. (11) Explain five of the following terms: (a) humus, (b) subsoiling, (c) exalbuminous seed, (d) leguminous plants, (e) cross-pollination, (f) green dressing, (g) chlorophyll, (h) cambium layer, (k) hilum, (l) muscle, giving examples where this is feasible. (12) Describe, using diagrams, the way in which the blood is sent to every part of the body of an ordinary, warm-blooded animal. (13) Fruits are classified in various ways. What different kinds of fruits do you know of? Give examples.

The questions that were answered best, from a general point of view, were numbers 1, 2, 8, 9, the first part of 10, and 11. A few very good answers were obtained, however, to questions 5, 6 and 7. The way of dealing with the remainder, namely, numbers 3, 4, 12 and 13, was bad, on the part of nearly all the candidates. It is not possible to furnish an adequate answer to questions 3, 4, 6, 7, 8, 10 and 12 without the use of diagrams, or sketches. This was recognized by several of the candidates, in relation to the questions that they attempted, and some drawings that were creditable for the purpose were furnished by them. Other candidates attempted these questions without the aid of drawings, thus giving themselves the greatest trouble in providing answers, which were only insufficient in the end.

In dealing with question 1, it was noticeable that most of the candidates understood that the answer was required to have relation to the nitrogen in the air, as well as to the oxygen and carbon dioxide, and useful references were made, in the first connexion, to the work of the organisms living in symbiosis with leguminous plants, as well as to that of nitrogen-fixing organisms in the soil. The facts required for question 2 were fairly well known, in most cases, but they were expressed in a bookish way, and if any attempt was made to show how the physical properties of soils depend on the proportions of their principal constituents, it was generally feeble. In no case was question 3 done well; with other questions, it shows the necessity for a greater grasp, on the part of candidates, of the importance of making their own observations. Some fair attempts at question 4 were received; it was understood, however, that this would not be widely answered. Some of the most thorough answers were those to question 5, especially in regard to the first part of it. Most of the candidates who attempted number 6 realized the necessity for the presentation of drawings, which were executed in a useful manner, in many cases. The ways of treatment of questions 7 and 8 should have been very similar. These, again, showed that candidates are very prone to take facts for granted, instead of constantly verifying them by their own observations. Fair answers were obtained to question 9. Nearly all the attempts of question 10 were disappointing; whereas every candidate should have been able to supply a satisfactory answer. The ground ranged over in question 11 gave candidates a good choice among the subjects that had been brought to their notice. No satisfactory answers to questions 12 and 13 were received. The attention of candidates is drawn respectively, in connexion with these, to Fream's *Elements of Agriculture* (seventh edition, 1910), pp. 359, 360, and to *Nature Teaching* (second edition, 1908), p. 230.

It was reported, from one centre, that the time given for answering the questions was too short. As a matter of fact, ample time was given for this. It is only where candidates, instead of answering concisely the question proposed, proceed to give a quantity of information about subjects with which it does not deal, that sufficient time does not seem to be allowed. There should be no doubt, once for all, that marks cannot be given for matter that is not required.

As has been indicated, a special paper had to be given in one case—that of St. Kitts—on account of the difference in date of the examination. The questions asked in this are presented below, for the information of candidates.

(1) What conditions are necessary for the germination of seeds? How would you show that these are necessary? (2) How do leaves help to feed the plant? (3) What is meant by the retentive power of a soil, and how is the possession of this property by soils important to the agriculturist? (4) Give an account of three crops that are used as green dressings, stating how they are employed for the purpose. (5) Write a description of any form of plough that you have seen in use. (6) Describe the operation of budding, and state why it is useful. (7) Write a short account of each of the manures that are employed for giving phosphorus to the soil. (8) Discuss the different uses of roots to plants, illustrating your answer by means of examples. (9) Why is the soil cultivated? Describe any method of cultivation with which you are familiar. (10) Explain five of the following terms: (a) cotyledon, (b) nodule organism, (c) parasite, (d) capillarity, (e) organic manure, (f) digestion, (g) leaf-bud, (h) medullary rays, (k) tuber, (l) loam. (11) Describe any flower, showing how its different parts are suited to the particular work that is required of them. (12) Compare the digestive systems of the horse and the cow, stating the uses of the various parts through which the food passes. (13) Describe, with the use of diagrams, the heart of a warm-blooded animal, and indicate how it performs its work of forcing the blood into the arteries.

FUNGUS NOTES.

FURTHER OBSERVATIONS ON DIE-BACK DISEASES.

Diplodia rapax, Massee, causes die-back of young Hevea trees in the Straits and Federated Malay States, as has been stated in the *Agricultural News*, Vol. IX, p. 318, where a description of the disease, both on young and older trees, is given. It may, however, prove of interest if a few facts in connexion with this fungus are added here, especially as, for reasons which will be given below, it seems possible that the information may have some application to cacao. The additional points of interest are the outcome of observations conducted in the Straits by Ridley. The account of them was published in the *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. IX, pp. 290, etc. In the first place, it was found that no spores of the fungus were produced unless the atmosphere was moist, and that the parts on which the pycnidia occurred were always quite dead and, frequently, commencing to dry. Infection experiments, which could only be conducted on a small scale, led to the following conclusions. The fungus is unable to attack the terminal bud directly, but can do so if it is injured in any way. It can also produce direct infection on young leaves which are not more than half-grown. After infecting the damaged terminal bud, the fungus spreads down the stem, in the cambium, though, if the seedling is healthy, its progress is eventually checked, apparently by the formation of an impervious corky layer. The same thing occurs in the case of the young leaves. These are killed by the fungus, and fall, being cut off from the plant by means of the usual absciss layer, which prevents the entry of the fungus into the tissues of the stem. If the seedling is unhealthy, the fungus may spread from the terminal bud right down the cambium, and kill the plant completely in a few days. When this happens, the most recently affected parts of the plant do not show any very definite external signs of disease, but the presence of the parasite in the cambium is indicated, on examination by a red discoloration of this tissue. Another result of the inoculation experiments was to show that slight wounds on woody stems do not serve as an easy means of entry for the fungus, as its spread from these is very slow, even when it occurs at all. It must however be borne in mind, that large wounds such as cuts made in pruning, and small wounds on green twigs permit the ready entrance of the fungus; and once it has obtained a strong hold on the cambium of a woody stem or branch, it spreads rapidly and the plant cannot stay its progress.

The life-history of the fungus occupies about seven days. That is, infected portions of the attacked plants die about six days after infection, and under favourable conditions fructifications make their appearance one or two days later. The spores from these can germinate again, on a favourable surface, in twelve hours. The ultimate fate of the plant on which they germinate depends on its vigour, and on the part attacked, as has already been indicated. The tree may be killed out in a few days, or may be able to throw off the disease.

The fact that the Hevea tree sheds its leaves periodically is naturally of great assistance to it in preventing any serious damage from fungus attacks on the leaves; so that this means of infection is probably not a very serious one, unless the whole twig on which the leaves are borne is in an unhealthy state from some other cause.

It was stated above that these observations may possibly have some bearing on die-back of cacao. The reason for this is that very possibly *Diplodia rapax* may prove to be identical with *Botryodiplodia elasticae*, Petch, which occurs very frequently on Hevea and other hosts in Ceylon Further, *Botryodiplodia elasticae* is almost certainly the same as *Lasiodiplodia theobromae*, Griffon and Maublanc, which is the West Indian die-back fungus of cacao. Consequently, *Diplodia rapax* and *Lasiodiplodia theobromae* may possibly prove to be one and the same. In support of the theory that *Diplodia rapax* is very possibly the same as the Ceylon fungus, *Botryodiplodia elasticae*, Ridley puts forward the following evidence. A fungus attacking Hevea in West Africa was identified as *Diplodia rapax* by Massee. Now, no specimens of this rubber plant have been sent from the Straits to West Africa, but specimens have been received from Ceylon, and on one such consignment a fungus, which must have been *Botryodiplodia elasticae*, was found to develop in transit. This fact, taken in conjunction with the description of the two species, makes their identity very probable. Now, in Ceylon, die-back of Hevea is originated by the attacks of *Gloeosporium alborubrum* on the young shoots. When the top of a shoot has been killed, *Botryodiplodia elasticae* obtains a hold, and completes the destruction of the tree (*Agricultural News*, Vol. IX, p. 270). In the Straits, the attack is originated by *Diplodia rapax* itself, without the aid of any species of Gloeosporium, and the same thing appears to be true with regard to die-back of cacao here. Consequently, Ridley's results may well represent the state of things that obtains in the case of the origin of the cacao disease. Local experience tends to show that this is actually so. On cacao, too, the disease certainly starts on injured young green shoots or terminal buds, as well as on big wounds. If the trees are in a healthy state, it is improbable that the fungus will do much harm; while if they are unhealthy from any cause whatsoever, the disease is likely to spread rapidly and prove serious, and if it is not attended to, the tree will die. The necessary remedial measures are well known, and need not be detailed in this article. It is generally found that die-back in the West Indies is particularly prevalent in exposed situations, where the young shoots are damaged by wind. It may, moreover, be added that moist conditions and excessive shade favour the spread of the diseases both on rubber and cacao; while poverty of the soil or insufficient drainage weakens the trees, and thus encourages the growth of the fungi in the tissues of their hosts.

ADDITIONAL NOTE ON PINK DISEASES.

In the *Agricultural News*, Vol. IX, p. 286, mention was made of a form of fungus closely resembling pink disease of cacao. This occurred on a stem of guava which was used to support a branch of cacao, and some of the cacao trees in the neighbourhood were attacked by the true pink disease. Specimens of the branches of the plants so attacked were recently forwarded to the Head Office, and this enabled a comparison to be made between the fungus on the guava and that on the cacao. The conclusion arrived at was that the two species were probably not identical; that on the guava, *Corticium laeve*, being probably saprophytic only; the other on cacao being *Corticium lilacino-fuscum*, which is a partial parasite.

Further information recently received indicates that the latter fungus has spread from the cacao to the woody stem of a pigeon pea plant, which was growing near. The fungus originated in a groove on the sheltered side of the stem, and subsequently spread to a considerable extent. Such a position as that mentioned would favour the germination of any fungus spores which might be lodged there by wind or rain, as it would afford a certain amount of moisture to start with, and prevent the spores from being blown away by the wind, or dried up by the wind or sun. The fungus probably commenced its growth purely as a saprophyte on any fragments of material that may have been caught in the groove. Once established, it could attack the plant itself. Recently, *Corticium javanicum* (the pink disease of rubber and other plants) has been found on Crotalaria in Southern India, this host having been planted as a green dressing for rubber. The two cases are of interest but not exactly parallel, since the fungus on the pigeon pea should prove easy to control in the usual way. Both fungi grow better in damp weather, so much so that the rubber fungus disappears during the dry season in Ceylon in many localities, and only reappears after the south-west monsoon, when fresh spores are blown on to cultivated plants from the jungle. Probably forest plants are also the source of infection in the case of pink disease in the West Indies.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market for the month of October:—

The general character of the markets during the month of October may be summed up in one word—normal, though exception may perhaps be taken in a few special instances, but these were mostly in products not affecting the West Indies. As was expected, the rubber boom has passed, and prices are now settling down to conditions that prevailed before the boom was started, and may probably drop even lower, with the likelihood of increased imports. Buchu leaves also continue to attract attention, but of West Indian produce the market condition was quite an average one.

GINGER.

There has been little or no demand for this article. In the early part of the month none was brought forward at the spice auctions, but at the last sale on the 26th, 178 packages of Jamaica were offered, all of which were bought in together, with 16 cases of Calicut, at prices ranging from 85*s.* to 95*s.* It was stated that sales had been effected privately for 150 packages of Jamaica.

NUTMEGS, MACE AND PIMENTO.

The two former, at the earlier auctions, have not been represented, but on the 26th, 29 packages of West Indian mace found buyers at the following rates: good pale 2*s.* 1*d.*, fair broken 1*s.* 10*d.* to 1*s.* 11*d.*, red 1*s.* 9*d.*, and broken 1*s.* 6*d* to 1*s.* 7*d.* Nutmegs were referred to only as private sales none being brought forward at auction. Pimento, likewise, has attracted but little notice; on the 19th, at auction, some 100 bags of greyish were offered, all of which were bought in at 2½*d.* per lb.

ARROWROOT.

There has been but very little demand for this article, but on the 26th, 20 half-barrels of Bermuda and 28 cases of Natal were offered, all of which were bought in, the first at 1*s.* 7*d.*, and the last at 9*d.* per lb.

SARSAPARILLA.

At the first auction on the 6th, the offerings were Lima-Jamaica 18 bales, native Jamaica 28 bales and Mexican 2 bales; of the first, 16 bales were disposed of at 1*s.* 4*d.* per lb. for good selected, and 1*s.* for fair. Of the 28 bales of native Jamaica, 4 only were disposed of at 6½*d.* per lb. for common dull mixed red and yellow. The 2 bales of Mexican found no buyers, 10*d.* per lb. being the reserved price. A fortnight later the auction opened with 21 bales of grey Jamaica, all of which found buyers at an advance over previous rates; 1*s.* 6*d.* being paid for fair fibrous, and 1*s.* 2*d.* for coarse. Native Jamaica was represented by 25 bales, but only one was disposed of realizing 9*d.* per lb. for dull red. Sixteen bales of Lima-Jamaica were offered and all bought in at 1*s.* 2*d.* per lb. Eight bales, only, of Honduras were brought forward and none sold, 1*s.* 2*d.* being the price at which they were held. Two bales of Guayaquil were offered and sold at 10*d.* to 10½*d.* per lb.

KOLA, LIME JUICE AND OIL OF LIME.

At the beginning of the month kola was reported to be in demand and scarce. At the first auction 22 bags were offered, 20 of which were West Indian. The whole were disposed of, the West Indian realizing 3¼*d.*, to 3½*d.* for fair bright and 2¾*d.* for mouldy. A week later, the demand being continued, 4*d.* was paid. On the 19th, 21 bags of Ceylon were offered and bought in at 5*d.* for fair dried. Two bags of very wormy fetched 2*d.* per lb. At the last sale, on the 26th, West Indian was represented by 10 bags of dried, which sold at 3¾*d.* per lb. Concentrated West India lime juice was quoted at the beginning of the month at £18 15*s.* and at the close dropped to £18 5*s.* Of good West Indian distilled oil of limes the supplies at the beginning of the month were limited, and prices varied from 1*s.* 5*d.* to 1*s.* 6*d.* per lb. and 5*s.* 9*d.* to 6*s.* for hand-pressed. At the close of the month there was a slight decline, fair West Indian distilled slightly rusty being sold at 1*s.* 4*d.*, and hand-pressed washed at 5*s.* 6*d.* per lb.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the S.S. 'Oruro', on November 24, 1910, for St. Lucia, for the purpose of conferring with His Honour the Administrator on official matters. Dr. Watts will probably return to Barbados by the R.M.S. 'Berbice', on the 29th instant.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, returned to Barbados on November 12, 1910, after leave of absence for about four months.

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, returned to Antigua on November 24, 1910, after about four months' leave of absence.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR November 8, 1910; Messrs. E. A. DE PASS & Co., October 28, 1910.

ARROWROOT—St. Vincent, $1\frac{15}{16}$*d.* to 3*d.*
BALATA—Sheet, 3/4; block, 2/4 per ℔.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 50/- to 54/6; Jamaica, 49/- to 54/-.
COFFEE—Jamaica, 50/- to 120/-.
COPRA—West Indian, £27 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 48/- to 51/- per cwt.; low middling to middling, 52/- to 56/-; good bright to fine, 57/6 to 62/6.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/1; concentrated, £18 5*s.*; Otto of limes (hand pressed), 5/6 to 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{16}$*d.*; fair, $2\frac{3}{16}$*d.*; good, $2\frac{5}{16}$*d.* per ℔.
RUBBER—Para, fine hard, $6/0\frac{1}{2}$, fine soft, 5/2; fine Peru, 5/9 per ℔.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/6 to 18/6; Muscovado, 11/6 to 14/-; Syrup, 11/3 to 11/6; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., October 28, 1910.

CACAO—Caracas, 11c. to 12c.; Grenada, $11\frac{1}{8}$c. to $11\frac{3}{8}$c.; Trinidad, $11\frac{1}{4}$c. to $11\frac{3}{4}$c. per ℔.; Jamaica, no quotations
COCOA-NUTS—Jamaica, select, \$34·00 to \$36·00; culls, \$20·00 to \$22·00; Trinidad, select, \$34·00 to \$36·00; culls, \$20·00 to \$22·00 per M.
COFFEE—Jamaica, ordinary, 11c.; good ordinary, $11\frac{1}{2}$c. to 12c.; and washed, up to 13c. per ℔.
GINGER—9c. to 12c. per ℔.
GOAT SKINS—No quotations.
GRAPE FRUIT—\$2·50 per box.
LIMES—\$5·00 to \$5·50.
MACE—38c. to 42c. per ℔.
NUTMEGS—110's, $10\frac{1}{4}$c. per ℔.
ORANGES—Jamaica, \$2·50 to \$3·25 per box.
PIMENTO—$3\frac{3}{8}$c. per ℔.
SUGAR—Centrifugals, 96°, 3·80c. per ℔.; Muscovados, 89°, 3·30c.; Molasses, 89°, 3·05c. per ℔., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 12, 1910.

CACAO—Venezuelan, \$11·35 per fanega; Trinidad, \$10·80 to \$11·25.
COCOA-NUT OIL—\$1·07 per Imperial gallon.
COFFEE—Venezuelan, 17c. per ℔.
COPRA—\$4·75 per 100 ℔.
DHAL—\$3·80.
ONIONS—\$3·50 per 100 ℔.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$1·70 to \$1·80 per 100 ℔.
RICE—Yellow, \$4·35 to \$4·40; White, \$4·75 to \$4·80 per bag.
SUGAR—American crushed, \$6·20 per 100 ℔.

Barbados.—Messrs. LEACOCK & Co., November 18, 1910; Messrs. T. S. GARRAWAY & Co., November 21, 1910; Messrs. JAMES A. LYNCH & Co., November 14, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 ℔.
CACAO—\$11·00 to \$12·00 per 100 ℔.
COCOA-NUTS—\$22·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$14·00 per 100 ℔., scarce.
HAY—\$1·20 per 100 ℔.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·50 to \$3·50 per 100 ℔.
PEAS, SPLIT—\$6·10 to \$6·40 per bag of 210 ℔.; Canada, \$3·45 to \$3·50 per bag of 120 ℔.
POTATOS—Nova Scotia, \$2·25 to \$3·00 per 160 ℔.
RICE—Ballam, \$4·85; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 ℔.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, November 12, 1910; Messrs. SANDBACH, PARKER & Co., November 11, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$8·50 to \$9·00 per 200 ℔., wanted	\$8·50
BALATA—Venezuela block	32c. per ℔.	Prohibited
Demerara sheet	78c. per ℔.	None
CACAO—Native	10c. to 11c. per ℔.	10c. to 11c. per ℔.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c per ℔.	12c. to 13c. per ℔.
Jamaica and Rio	15c. per ℔.	17c. per ℔.
Liberian	$8\frac{1}{2}$c. per ℔.	10c. per ℔.
DHAL—	\$3·60 to \$3·70 per bag of 168 ℔.	\$3·60 to \$3·75 per bag of 168 ℔.
Green Dhal	\$4·00	——
EDDOS—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe		——
Madeira	3c. to $3\frac{1}{4}$c.	$2\frac{3}{4}$c. to $3\frac{1}{2}$c.
PEAS—Split	\$6·00 per bag (210 ℔.)	\$6·20 per bag, (210 ℔.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	\$2·50	\$2·50
Lisbon	——	No quotation
POTATOS-Sweet, Barbados	\$1·32 per bag	——
RICE—Ballam	\$4·80 to \$4·90 per 175 ℔.	\$4·80
Creole	\$4·50 to \$5·00	\$4·35 to \$4·75
TANNIAS—	\$2·76 per bag	——
YAMS—White	\$2·64	——
Buck	\$2·40	——
SUGAR—Dark crystals	\$2·10 to \$2·15	None
Yellow	\$2·80 to \$3·25	\$2·65 to \$2·80
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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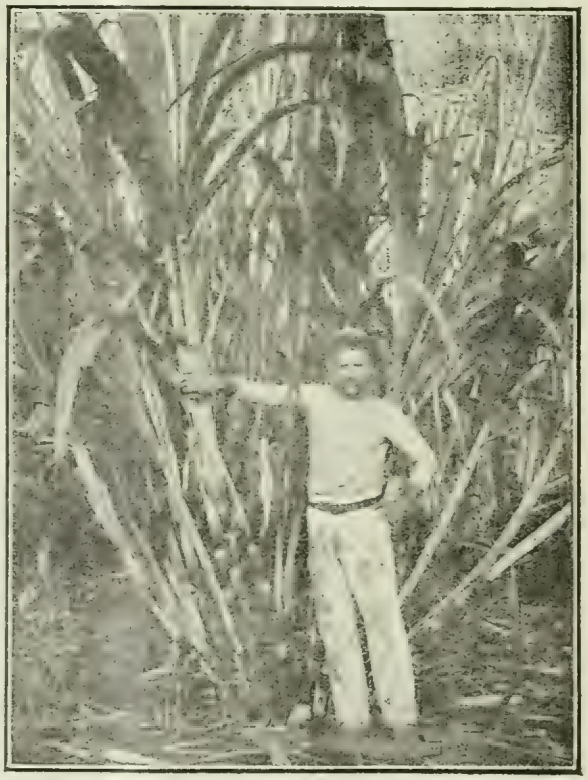

AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW OF THE IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. IX. No. 225. BARBADOS, DECEMBER 10, 1910. PRICE 1d.

CONTENTS.

The Cultivation of Citrus Plants in Florida.

DURING the time that the Entomologist to the Department was on leave, recently, in the United States, a visit was made by him to Florida for the purpose of making observations on citrus cultivation, especially in regard to the control of pests in the plantations. The information gained by him is of particular usefulness, because the growing of citrus products constitutes the most valuable agricultural industry of the State. This is indicated by the fact that the value of the exports of such products from Florida, during the last season for which figures are available, was nearly $4\frac{1}{4}$ million dollars. Although the raising of citrus fruit is an industry of secondary importance in the West Indies, the fact of its existence, and the extension that is taking place at present, justify the gaining of information arising from the experience of others, whenever the opportunity is available.

The conditions in Florida are of particular interest to fruit growers in the West Indies, because the climatic conditions in the two places are generally similar. Florida, unlike California, which is the other great citrus-producing region of the United States, has a fairly humid climate, the rainfall being about 54 inches. The greatest matter of difference, from an agricultural standpoint, is its possession of an open, permeable soil with a flat surface and a high water table. The methods of cultivation and the use of manures in the best orchards in Florida are the results of experience extending over many years, so that they form matters worthy of consideration by every citrus grower who carries on the work under similar conditions.

The distance of planting of the trees is such that the branches of different plants are never allowed to touch one another. The chief reason for this is the necessity for the provision of room for working around the plants, and for spraying and fumigating, the last of which are employed to a fairly large extent in the State, in connexion with citrus culture. When a plantation has been made, no deep tillage is practised after the roots have taken possession of the ground. The procedure adopted is to work the surface soil lightly during the early part of the season. Subsequently, weeds are allowed to grow up, undisturbed,

between the trees; or there is the alternative practice of growing a leguminous cover crop. For the latter purpose, beggar weed (*Desmodium* sp.) is often sown. This, it may be mentioned, is closely related to the plants known as 'sweetheart' in the West Indies, which are commonly found in pastures, where they produce pods having D-shaped sections which stick to the clothes and coats of passing animals.

The chief manures employed in citrus culture in Florida are potash and phosphates, together with lime when this is required, particularly for the purpose of correcting acidity of the soil. Applications of nitrogenous manures are only made sparingly since, as is well known, the stimulation of the vegetative growth of plants by such manures encourages the production of inferior fruit known as 'ammoniated fruit', and the plants make soft, sappy growth. The latter circumstance is of much importance in relation to attacks by white fly (*Aleyrodes citri*), as this pest always appears to be most prevalent on plants exhibiting a large amount of soft tissue in their growth. Particular significance is attached to the matter in Florida, as white fly is the principal pest of citrus plants in that State.

The growing of weeds and cover crops in the orchards is considered to be of much value by the proprietors, especially because such plants aid in keeping the air of the groves moist. It is in this way that they aid indirectly in the control of the white fly and scale insects, because the humid conditions that are induced form the best medium for the growth of the parasitic fungi which keep these under control. This is in addition to the use of such plants in affording protection to the soil, cover for insect enemies of the pests, and in the case of the leguminous plants, nitrogen for the soil.

A point of great difference between conditions in Florida and those in the West Indies is the extent to which they are favourable for spraying and fumigating, in the first mentioned country. This is why these methods for controlling pests have been adopted there to a considerable extent. It must not be forgotten, however, that in many cases in Florida, the main dependence for the control of insect pests is placed on their natural fungus enemies, because it is found that the employment of this means is more satisfactory and cheaper than spraying and fumigation. On occasions when such control is for any reason found insufficient, spraying materials are employed which are incapable of causing injury to the beneficent parasitic fungi, thus giving these an opportunity to survive, and to become effective once more in their special connexion. It seems that a greater use might be made of this principle of control in the West Indies. As regards the direct use of the parasitic fungi as a means of keeping insect pests in check, this has become a matter of commercial concern, and there are firms in existence whose chief work is to keep in stock supplies of the useful fungi, and actually to undertake the labour of disseminating the spores throughout the orchards. Such a circumstance is one of the best indications as to the practicability of the employment of natural control of citrus pests on a large scale.

A final matter of interest is that experiments which are being conducted with lime cultivation in Montserrat (see *West Indian Bulletin*, Vol. XI, pp. 1 and 39), as well as in other parts of the West Indies, indicate that the methods to be used for the control of pests and for cultivation by citrus growers in these islands are likely to be very similar, with modifications in accordance with the local conditions, to those that are being carried out in Florida.

SUGAR INDUSTRY.

THE PREVENTION OF SCALING BY CALCIUM SULPHATE, IN EVAPORATORS.

The following extracts dealing with this matter are taken from Bulletin No. 33 of the Hawaiian Sugar Planters' Association, in which work done in connexion with the subject is described:—

Two methods suggest themselves for correcting the trouble due to the formation of sulphate scale: the use of barium salts or sodium carbonate in the juice during clarification. The first reatment tremoves the sulphuric acid by precipitation from the juice as sulphate of barium; but the method is open to grave objections on account of the poisonous nature of the salts of barium and the danger of accidentally introducing them into products intended for human consumption. The addition of sodium carbonate, in conjunction with lime, to a juice may be expected to have one of two actions. (1) If not enough lime is supplied to the juice to produce an alkaline or neutral reaction, much of the phosphoric acid would not be removed, although there is sufficient lime to combine with all the phosphoric acid remaining. This is due partly to the solubility of phosphate of lime in sugar and salt solution, but more largely to the increased solubility of lime phosphate in an acid liquid. If to such a liquid sufficient sodium carbonate is added to produce alkalinity, the lime phosphate would be largely or almost entirely rendered insoluble and removed from the juice in the clarifier settlings. (2) If lime is added in sufficient quantity to pro-

duce the alkalinity necessary for the removal of the larger proportion of the phosphates, there is always then an excess of lime sufficient to produce trouble in juices similar to that under consideration, i.e., the formation of lime sulphate. When sodium carbonate is added to a solution of the lime sulphate, a double reaction takes place, calcium carbonate and sodium sulphate resulting. When juice with lime in excess for clarification, and a high content of sulphuric acid, is treated with the sodium carbonate, the insoluble calcium carbonate will settle out in the clarifiers, only an unimportant amount being retained in solution in the juice. The sodium sulphate, being very soluble, will continue through the course of manufacture into the final molasses. Whilst the unnecessary introduction of foreign soluble salts into the juice is usually to be avoided, it is not thought that sodium sulphate will have any serious effects. Koehler is quoted as finding that 'certain salts, notably sulphate of soda, chloride of calcium, and sulphate of magnesia, even possess the property of causing the precipitation of a considerable proportion of the sugar in solution in the liquid.'

The use of sodium carbonate in addition to lime has been advised, although not as a corrective for scale. Geerligs writes: 'It happens in many cases that cane juice has an acid reaction, although sufficient lime has been added to precipitate all impurities. It is not advisable to evaporate such acid juices, and they should therefore be neutralized, which may be effected during defecation, or afterwards on elimination of the settled juice. Until a few years ago, lime was exclusively used for this neutralization, but as lime salts always cause more trouble during the subsequent operations than soda salts, soda has been adopted for this purpose. For purifying purposes lime is, of course, the indispensable agent.'

The results obtained in the investigations lead to the following conclusions:—

Sodium carbonate clarification is indicated where a juice contains excessive quantities of sulphuric acid, and tends to form troublesome incrustations of calcium sulphate. Lime should be added to neutrality or faint acidity, and the juice made akaline by sodium carbonate. This latter reagent completes the precipitation of the phosphoric acid and further, depending on the extent to which it is supplied, removes calcic salts from the juice. The removal of these salts lessens the extent of possible scale formation. It has a further advantage, as much of the trouble found in the working and handling of low grade products is ascribed to the presence of lime, and the decomposition products of non-sugars due to the action of lime at high temperatures. Amongst others is the froth fermentation of molasses, which is most frequently found where the juices have been overlimed. Further, the increase in acidity of the molasses from successive boilings is due to the decomposition of the lime glucose compounds, lime glucinate, etc., at high temperatures.

The addition of sodium carbonate will probably increase the work of the filter presses, but as it will produce a sediment, which by its nature should permit of easy and complete washing of the scums, this objection may be only apparent. The prime objection is the cost of clarification, which will be materially increased. Whether this increase of cost will be more than compensated for by the saving in labour, wear and delays due to incrustations on the tubes of the evaporators is a question which can be answered only by trial in the mills presented with this problem.

The general conclusions may be summarized as follows :—

The use of sodium carbonate in addition to lime in clarifying juices :—

(1) Decreases the amount of insoluble ash in the filtered juice.

(2) Decreases the amount of phosphoric acid.

(3) Decreases the amount of lime.

(4) Increases the amount of mineral matter removed by filtration, or the equivalent of the work of the filter presses in factory operations.

(5) In juices of high sulphuric acid content, not enough lime will be left to form a serious lime sulphate scale.

(6) Effects a partial removal of magnesia from the juice.

(7) Effects a slight increase in organic impurities removed from the juice.

(8) Improves the working of after products by the removal of calcium salts.

(9) On account of the cost of the material, the expense of clarification will be materially increased.

CENTRAL SUGAR FACTORIES IN LOUISIANA.

Though the number of active sugar houses in the State has fallen off to a degree where these days it is getting to be only the fittest that survive in the fight for life, the quantity of cane disposed of at the lesser number of factories is in no way reduced, and we see the situation in a much improved light for the cane grower selling his crops. The planter who runs his field as a feeder to mills owned by other parties is finding that not only is he able to command better prices for his cane than formerly (when the more inefficient sugar houses were unable to pay what the owners of the economically run are able to do with cheaper cost of manufacture), but he also finds that modern facilities for the removal of crops from field to factory, and the rapidity with which the large mills dispose of vast quantities of raw material, are benefits such as the lack of in days past cost many a cane seller the loss of portions of his crops in occasional bad harvesting seasons.

To-day, we see in Louisiana about fifty central factories capable of grinding around 50,000 tons, or over, in a season of sixty days or less, and some of these have facilities for handling considerably over that amount. There are, in fact, at least a dozen of these centrals equal to the disposing of around 100,000 tons of cane in a season, and about half that number are scheduled to pass the mark this season, while of the remainder upwards of twenty are due to go beyond 50,000 tons. Ranging below these are considerable numbers which will grind from 30,000 to 40,000 tons, and through the way affairs are progresssing in the enlargement of equipment in the Louisiana sugar houses, the better fitted and bigger factories are soon to be even more decided in majority.

The effect of having such manufacturing resources to rely on has stimulated cane-growing efforts on the part of numerous land-owners who would not have continued in the business but for the advantage offered by the central factories. With the changes that were made in developing great capacity plants from smaller ones, the cane grower was encouraged by keener competition for his cane, and had the advantage offered him of short hauls to place the cane on either standard or narrow gauge railroad; the greatest advantage, though, rests with the knowledge that the big mill is ready to take his cane about as fast as he can get it off the field, and taken altogether, it is obvious that the central factory system as developed within the past two decades, and increased to a larger extent within the past ten years, is the very life and salvation of the Louisiana sugar industry. (The *Modern Sugar Planter*, October 22, 1910.)

FRUITS AND FRUIT TREES.

PLANT PROTECTION IN BRITISH COLUMBIA.

Extracts from a report by the Chief Inspector of fruit and other trees, British Columbia, have been received from the Agent-General. These deal with the measures that are taken to prevent the introduction of insects and other pests into the orchards and gardens of the Province.

The report shows that all trees and plants are inspected individually, and that the inspection is not confined to imported nursery stock alone, but is extended to all the local nurseries. Even selling or shipment of plants is not permitted, until they have been examined by a capable inspector. During the first four months of the present year, the number of imported plants inspected was nearly two and three-quarter million, and there is a likelihood that this number will reach four million before the end of the year. The fact that this import exceeds, by 173 per cent., the quantity imported during any previous year, is a valuable sign of the rapid development of fruit-growing in British Columbia. Although the labour involved in inspecting and repacking the individual plants has been very great, there have been no complaints of miscarriage.

The essentially useful nature of the work is indicated by the fact that two colonies of the caterpillars of the gypsy moth were discovered among the importations, and destroyed. When it is considered that the existence of this pest, alone, has caused an expenditure of millions of dollars in the United States, especially in Massachusetts and the adjoining New England States, the value of the work that is being done in preventing the importation of such insects is easily realized. It is pointed out in the report, in connexion with this matter, that the knowledge of similar facts and conditions makes it impossible to afford the taking of the slightest chance of the introduction of such pests into British Columbia, and that any delay at the inspecting station, on account of the examination, which may have been complained of, has been well justified.

The work in connexion with the delivery of plants from local nurseries has caused the condemnation and destruction of some 16,000 trees grown in such nurseries, during the seven months ending April 30, 1910. It is a matter for encouragement that this system of local nursery inspection is very popular with fruit growers, who now regard it as a necessary additional protection.

THE PROPAGATION OF MANGOS BY CIRCUMPOSITION.

A communication has been received from Mr. T. Jackson, Curator of the Botanic Station, Antigua, which states that recent attempts to propagate the mango by the ordinary methods at the Scott's Hill experiment station in that island have been failures, because of drought. At the time at which this work was being done, an attempt was made at the Botanic Station to propagate the plant by circumposition. This was successful.

The procedure was to select shoots, each possessing a diameter of about ½-inch. In working, the cut in these was made sufficiently deep to enter the cambium. The cut part of the stem was then tied up in pieces of split bamboo, the hollow places being filled with soil. Subsequent attention merely included an occasional watering of the plants.

It is suggested by Mr. Jackson that this method should afford a simple way of raising mangos of choice varieties. It possesses an advantage over grafting by approach, in that the latter requires the possession of a stock at least two years old. The further suggestion is made that the better types of cacao might be propagated in this manner. Experiments in this direction are being carried out at the Botanic Station.

CLEANSING FRUIT TREES.

We have figures for two important items in connexion with citrus trees: (1) for washing to clear off white scale, moss, lichen and all parasites; (2) for picking off young fruit that comes at the wrong time, and would have retarded the early crop aimed at.

The hand-washing with lime and sulphur wash, including cost of wash, cost about 1½*d.* per tree; picking off the fruit, which was laborious as the fruit was small, cost about 1*d.* per tree. December is the time of the year to clean down the fruit trees. If white scale is present (if there is copious and continuous rain little scale is seen) use the lime and sulphur wash; but for moss and lichen, lime wash alone.

Grape fruit and orange trees can be worked to bear in August and September. Woodashes spread around the roots—not heaped up against them, if orange trees—will help them considerably towards bearing large, good-keeping fruit. (*Bulletin of the Department of Agriculture*, Bahamas, Vol. V, No. 3).

AGRICULTURE ON THE GOLD COAST.

GENERAL. The Agricultural Department has done excellent work during the year, and has endeavoured, through travelling instructors, both European and native, to disseminate more scientific methods of cultivating and preparing agricultural and economic products.

The quantity of cacao exported from the colony during the year amounted to 45,277,606 lb., valued at £755,347, compared with 28,545,910 lb., valued at £540,821, in the year 1908.

The cultivation of this product is rapidly extending in the Eastern and Central Provinces of the colony, and in Ashanti; but no means exist, at present, of accurately estimating the area under cultivation. With the very rapid growth of this industry—which, owing to its being almost exclusively in the hands of native farmers, has developed on somewhat primitive lines—have come various insect and fungoid pests; but many of the farmers, thanks to the energy of the travelling instructors, are alive to the danger, and are taking steps to rectify matters. Printed instructions on the subject, issued in native languages, have been widely disseminated.

The following figures tend to show that improvement has been made in the quality of Gold Coast cacao:—

Average price per cwt:—	1908.		1909.	
	s.	d.	s.	d.
Trinidad (fine West Indian)	77	0	58	6
Accra (British West African)	60	0	50	0
Difference	17	0	8	6

The quantity of rubber exported during 1909 was 2,764,190 lb., as compared with 1,773,248 lb., in the previous year. The systematic cultivation of this product is now rapidly extending, but the whole of the output is still obtained from trees and vines (Funtumia and Landolphia) in the vast undeveloped forests of the interior.

The output of kola continues to show a steady increase, the export value for the year 1909 being £93,850, and that for the year 1908, £84,362.

Oil palm products were subjected to various experiments during the year, and the results have been published in the *Kew Bulletin.* The export value of palm kernels shows an increase of £34,604 on the preceding year, while that of palm oil shows a decrease of £8,557.

FORESTRY. The nucleus of a Forestry Department was formed during the latter part of the year. The conservator, Mr. McLeod, arrived in the colony in September, and was engaged for the remainder of the year in investigating the principal forest areas with a view to their conservation and the acquisition of reserves.

PRODUCTS EXAMINED AT THE IMPERIAL INSTITUTE. Reports on the following subjects have been furnished to the Government of the Gold Coast from the Imperial Institute, as the result of investigations conducted in the Scientific and Technical Department, supplemented when necessary by technical trials by manufacturers and commercial experts. In many cases, recommendations have been made as to the further action which is required in the Colony to develop the production of materials, for which there would be a satisfactory commercial demand.

Samples of Funtumia rubber in the form of 'crêpe' and 'lump' were examined. The latex was stated to have been coagulated by the juice of the 'Diecha' vine, which has since been identified at Kew as *Strophanthus Preusii*, Engl. et Pax. The action of this coagulant is under investigation at the Imperial Institute.

The crêpe rubber was of very fair quality, although the percentages of resin and insoluble matter were higher than in some samples of Funtumia rubber from the Gold Coast previously examined. It was valued at 5*s.* per lb., with fine hard Para at 5*s.* 4*d.* per lb.

The lump rubber, as received, contained an excessive quantity of moisture, amounting to nearly 50 per cent. by weight. The partially dried rubber was valued at only 2*s.* 3*d.* per lb., with fine hard Para at 5*s.* 4*d.* per lb. The commercial value of this rubber was therefore considerably enhanced by its conversion into crêpe.

A series of forty-eight of the principal timbers of Ashanti, collected by Captain C. H. Armitage, D.S.O., was examined. The majority of these timbers would be useful locally for constructional and other purposes, whilst certain of them resemble mahogany, cedar, and other well-known woods, and might be suitable for export. Of the latter group, the following were regarded as the most promising: Odupan (*Khaya* sp.), Dubin or Odubin (*Khaya* sp.), Krubna or Okumankra (*Khaya* sp.), and Krubna or Akwabohori (*Khaya antholica*). The report on these timbers will be published in due course in the *Bulletin of the Imperial Institute.*

Three native varieties of cotton from the Gold Coast, including 'Volta River' and 'Native Green-seed', were of good quality and worth 4½*d.* to 5½*d.* per lb., with middling American at 5·05*d.* per lb. Another sample, grown near Akim, and probably a native variety, was rough, somewhat stained and worth about 6*d.* per lb., with middling American at 5·54*d.* per lb. A sample from the Ancobra River represented a good class of cotton, but was much depreciated in value by the large proportion of stains, which appeared to have been caused by insect pests in the crop. It was valued by brokers at about 6*d.* per lb., with 'middling' American cotton at 5·54*d.* per lb.

A botanical specimen of the ogea or gum copal tree was identified at Kew as *Cyanothyrsus Ogea*, Harms. It is believed that ogea gum is derived from two or three different, but allied, plants, and endeavours are being made to determine these.

The kernels of Carapa seeds were valued at £11 5*s.* per ton by a firm of oil seed crushers, who offered to take a trial consignment of 50 tons of the kernels at this price. (*Colonial Reports*—Annual, No. 654.)

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated November 25, 1910, gives information as follows:—

The weather during the fortnight has been very warm and suitable for reaping and milling, and deliveries of rice to town have been fairly large. Reaping of paddy in some districts has been completed, and we expect a shortage on last year's crop.

Prices have remained firm, and we look for an advance shortly.

Shipments to West Indian islands during the fortnight amounted to 2,000 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally, 19*s.* to 20*s.* per bag of 180 lb. gross.
18*s.* to 19*s.* ,, ,, ,, 164 ,, ,,

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 7, with reference to the sales of West Indian Sea Island cotton :—

There has been no business reported since our last report in West Indian Sea Island cotton.

Florida and Carolina Sea Islands remain firm in price, with a limited business doing.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 12, is as follows:—

The market opened firm with Factors holding for full previous prices, and sales were made of 200 to 300 bales on a basis of Extra Fine 40c., Fully Fine 38c.

Toward the end of the week, however, there was a quieter feeling, resulting in sales of Fully Fine at some concession, making the total sales of the week 700 bales.

As the advices from the Islands continue unfavourable, crop estimates are being reduced 10,000 to 11,000 bales. With only this limited supply in view, the Factors and Planters are disposed to remain firm in their asking prices.

We quote :—

Extra Fine Islands	40c. = 22*d*., c.i.f. & 5 per cent.
Fully Fine ,,	37c. to 38c. = 20½*d*. to 21*d*. c.i.f. & 5 per cent.
Fine ,,	36c. = 20*d*. c.i.f. & 5 per cent.

THE COTTON INDUSTRY OF PERU.

The following information concerning the cotton industry of Peru is extracted from *Peru To-day*, for July 1910:—

The possible commercial and industrial importance of cotton was realized in the fifteenth century, soon after which it was systematically manufactured in France, with gradual inclination to other European countries. Pizarro, it is said, found cotton fabrics in ancient Peruvian tombs, which some modern archaeologists trace back to civilization antedating that of the Incas. Peru, to-day, is famed for its cotton, for the improved production of which extensive irrigation works have been undertaken in the Departments of Piura, in the north, and Lima. The labour employed at the plantations is generally native, being cheap and efficient.

Peruvian cotton is exported in bales, principally to England and the United States, the annual export averaging 20,000 tons, representing more than $5,000,000.

CULTIVATION. The cultivation of cotton in Peru, according to Mr. Gerardo Klinge, the director of the Lima Experimental Station for Cotton, differs essentially from that in the other cotton areas of the world, owing to the special cultural and climatic conditions of the country.

The principal cotton-producing districts are near the coast, and extend between the parallels 6 '30″ and 19′ 0″, south latitude. Most of these districts are occupied by vast desert-like valleys, which are irrigated from the rivers flowing from the Andes into the Pacific. While the methods of irrigation are not the best, they are simple and adequate, equal in every respect to the necessities of the fields. This work is done principally by means of canals, branching from the main rivers, in which the Peruvian cotton grower has shown to advantage his skill and understanding.

DISEASES AND PESTS. In the treatment of cotton diseases, an ounce of prevention is worth many pounds of cure. The diseases characteristic of the plant are many, the principal being: yellow leaf blight, red leaf blight, shedding of bolls, frenching, sore shin, anthracnose, and root rot. Peruvian cotton, however, is practically free from the attacks of any of these diseases.

Mr. C. F. H. Townsend, an American expert on plant life and disease, is at present in Peru. He is making important studies in the cotton districts. Attached to the United States Department of Agriculture, he has been temporarily engaged by the Peruvian Government to study the parasite that does some damage to the cotton plant in the districts of Piura. It is said that Mr. Townsend has succeeded in finding another insect that will destroy the parasite. However, it will take some time to obtain practical results. So far, the damage inflicted has not been very great, nor is it likely that it will extend, though the foresight of the Peruvian Government for having taken precautions is to be admired.

IRRIGATION. It is only in recent years that irrigation has been done systematically in the Peruvian cotton districts around Piura. Prior to 1891, the success of the crops rested greatly in the periodical rains. In Piura, such rains used to occur at intervals of seven years, and sufficed to soak the soil and allow of enormous areas being sown; the crops requiring no irrigation during the subsequent years. The last of these was in 1891, and, thenceforward, the construction of irrigating canals in Piura has rendered cultivation independent of the rains.

PRODUCTION. The production of Peruvian cotton per hectare varies according to the age of the plant. From two to three years is said to be the best age, and it is estimated at 750 kilos. of seed-cotton per hectare [660 lb. per acre], with a yield of 35 per cent. of lint. The cost of producing native cotton is placed at 5½c. a kilo.

Three classes of cotton are cultivated in Peru: rough Peruvian; American upland, short staple, a variety introduced and cultivated since the Cival War; and the long staple varieties of Sea Island and Mitafifi. Of the total production, however, 65 per cent. is American upland,

32½ per cent. is Peruvian, and 2½ per cent. is Sea Island and Mitafifi.

MANUFACTURING. Nearly 90 per cent. of the production is exported. The remainder finds its way to the local mills.

There are several modernly equipped cotton factories in Peru, the principal being in the outskirts of Lima, Ica, and Arequipa. Altogether there are about 1,500 looms, with an annual consumption of more than two and a half million kilos.

MARKET. Peruvian cotton is exported largely to England and the United States, Liverpool being the principal market, though a large quantity is shipped to New York. Germany, France, and Japan are also buyers of Peruvian cotton.

EXPORT VALUE. In 1909, the exports of cotton, and products derived therefrom, showed a satisfactory increase over those in the preceding year. In that year, the exports were as follows: Cotton 47,641,776 lb., representing $6,117,095; seed oil 90,391 lb., $6,235; cotton seed 17,160,660 lb., $78,940; oil cake 9,843,556 lb., $113,200; or say, an export value of $6,315,470. Allowing for what was consumed in Peru in the same year, the total value of the crop did not run far short of $7,000,000, and the area under cultivation was 50,000 hectares [125,000 acres].

GENERAL. The exceptionally favourable conditions in 1910 have led it to be expected that 25,000 metric tons of cotton will be exported in the course of this year.

The time is not remote when the various irrigation project shall have been perfected by the American engineers now in the field, and when foreign capital will at last open its eyes to the wonderful possibilities of cotton cultivation on a large scale, and with modern methods, in this country, where such adequate climatic and topographical conditions prevail.

By what has been stated, it will have been made plain to the reader that the cotton industry of Peru is enjoying a steady career of progress, and that the country is well on the way to occupy a prominent place among the great cotton producers of the world.

PRIZE-HOLDINGS COMPETITION IN CARRIACOU.

The following account of the first prize-holdings competition held in Carriacou, in August last, is extracted from a report to the Chairman of the Board of Agriculture, Grenada, by the Judges, who were Messrs. W. M. Malins-Smith, and G. G. Auchinleck, B.Sc., Superintendent of Agriculture, Grenada.

RESULTS OF JUDGING. The actual inspection of holdings was carried out on Friday 26th and Saturday 27th, all arrangements having been kindly made by Mr. G. Whitfield Smith. There were very few entries, as the aims of the scheme were not fully understood by the peasants, but good holdings were inspected in all the districts of the island, and it was felt that for the first year an effort should be made to apportion the prizes so that each district should be represented and the scheme more widely advertised. In view of the small number of entries, it was deemed best to depart somewhat, for this year, from the rules governing the judging, and we grouped all the holdings into one class; there will thus be two first, two second, and two third prizes, and the following list shows the total number of entries, the districts in which they lie, and the suggested apportionment of the prizes:—

			£	s.	d.
Alfred Dickson	Beauséjour	1st Prize	2	10	0
Bristol Gabriel	,,	3rd ,,	1	0	0
John Robert	,,				
Alexander Charles	,,				
William Pegus	L'Esterre	2nd Prize	1	10	0
John Antoine	Harvel Vale				
Peter Placid	,, ,,	3rd Prize	1	0	0
Steven Mark	Top Hill	2nd ,,	1	10	0
David Alfred	Grand Bay	1st Prize	2	10	0
			10	0	0

After reporting on the general condition of the prize-holdings, the judges make the following suggestions:—

SUGGESTIONS FOR FUTURE WORK. In the original rules proposed for governing the prize-holdings in Carriacou, two classes were suggested, one of which should be judged for the actual crops on the land, the other for methods of tillage and condition of premises. In future competitions, we beg to suggest that there be one class recognized, as was the case this year, and that the following points be kept in mind by the judges:—

(1) Tillage.
(2) Drainage.
(3) General condition of crops.
(4) Best crop on the land.
(5) Separation of the different crops.
(6) Best plot (separate) of ground provisions
(7) Conservation of manures and leaf-mould.
(8) Neatness of premises and purity of drinking water.

We suggest that a new set of rules be formulated and printed in accordance with these suggestions, together with a suitable scheme for marking to be used by the judges.

PERIOD OF THE YEAR FOR JUDGING. As the points to be noted by the judges include both preliminary tillage operations and final reaping ones, and as it is obviously impossible to arrange for two separate visits each year, we suggest that in future, the judging take place in July to August, as being a period at which the crops have made fair growth, and yet some idea of tillage can be formed.

STATUS OF PRIZE WINNERS. As the aims of the scheme were not fully understood this year, and as little real competition resulted, it will be best that prize winners of this year should not be debarred from winning prizes next year. Eventually, of course, some condition will have to be imposed to prevent the winning of the same prize several years in succession by the same competitor.

In closing, we beg to express our sincere appreciation of the kind manner in which we were received by the Commissioner, Mr. G. Whitfield Smith, the interest he evinced in our work, and the aid which he lent us in meeting peasants and visiting their holdings.

Particulars have been received of an International Horticultural Exhibition (Grande Exposition Internationale d'Horticulture), to be held in Florence during the first fortnight of May, 1911, in commemoration of the fiftieth anniversary of the proclamation of the Kingdom of Italy. This will include a colonial section, dealing with such matters as horticultural plants and products, methods of packing, botanical and entomological preparations, and horticultural publications.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial has for its subject the Cultivation of Citrus Fruits in Florida. Facts of a general nature are presented in it, relating to matters which came more particularly under the notice of Mr. H. A. Ballou, M.Sc., Entomologist to the Department, during his recent visit to Florida.

On page 386, there are presented extracts from a recent bulletin, published in Hawaii, and dealing with the prevention of scaling by calcium sulphate, in evaporators.

An interesting note on recent experience in propagating the mango, in Antigua, is given on page 388.

Page 391 contains an account of a recent prize-holdings competition held in Carriacou.

The Insect Notes, on page 394, give an account of plant bugs injurious to cotton bolls.

The interests of Entomology are also served by a review, on the next page, of Maxwell-Lefroy's valuable work dealing with Indian insect life.

The subject of the Fungus Notes (page 398) is Miscellaneous Fungi Recently Examined. The article is illustrated by four blocks, the first three of which are reproduced after Prillieux, and the last after Duggar. For convenience, figures 38 and 40 have been placed on their sides; the subjects with which they deal would be more correctly represented with the pointed ends of the illustrations upward.

Cacao in Brazil, 1910-11.

It is reported by H. M. Consul at Bahia that the quantity of cacao arriving at that port from the interior is much less than that received during last year. In the past six months, the amount has been 15,198,216 lb.; while during the corresponding period of 1909 it was 23,661,132 lb. The amounts for the next six months are estimated at about 33,000,000 lb., so that the total for 1910-11 should be about 48,180,000 lb., as compared with 63,888,000 lb. during 1909-10—a decrease of 24 per cent., which is said to be due to unfavourable weather and a deficiency of labour. According to the *Board of Trade Journal* for October 27, 1910, which gives an abstract of the report, the recent rise of 3*d.* on the exchange is causing cacao to be held back, in the interior, in the hope of a fall. The same report states that the general opinion is that the prospects for next season are favourable.

Agriculture in Nyasaland, 1909-10.

A review of the agricultural situation in Nyasaland is given in *Colonial Reports*—Annual, No. 655, in which it is stated that it may fairly be said that the past year has been one of the most satisfactory ever experienced in the Protectorate. The forward movement, though it relates specially to cotton, is not confined to that product, but includes other important crops, and seems to be of a lasting nature.

The speculative nature of the coffee crop in Nyasaland is causing it to be discarded gradually in favour of cotton and tobacco; for this season the total area was 6,037 acres, of which something more than one half (3,957 acres) was in bearing. The export was 187,000 lb. less than that of the preceding season, being 748,410 lb.

A good cotton crop has been harvested, and the industry is quickly increasing in importance. Particulars as to this were given on page 359 of the current volume of the *Agricultural News*, so that there is no need to enter into these at present.

As regards tea, the limited area within the Protectorate which is suited to this crop causes it to remain of minor importance, although, in the degree to which this product is grown, the prospects are promising. Experimental plantations have been made on the southern slopes of Mlanji mountain, where the rainfall is between 70 and 90 inches, and where there are at least 20,000 acres suitable for this crop. These have met with success, and though there is a doubt whether the yield from these estates will be as high as that on the best plantations in Ceylon, the quality of the tea is superior to that of low country Ceylon; the prices obtained last year varied from 5*d.* to 7*d.* per lb., in London. The export for last year was 36,281 lb., which exceeded that of the previous year by about 12,000 lb.

An exceptionally good tobacco season was experienced, and an average of over 500 lb. of cured tobacco of uniformly superior quality was obtained on several estates. This crop is second only to cotton in importance in Nyasaland. Some idea of this importance may

be gained from the fact that it covers already 2,368 acres, although its production is a comparatively new industry; while 1,084,757 lb. of cured tobacco was exported, as compared with 570,102 lb. for 1908-9. During the year, a certain amount of good sun-dried tobacco was produced by natives, and sold for export to a local firm.

Para rubber can only be cultivated in a restricted area, in West Nyasa district; here, 600 acres of Para rubber are being grown successfully. The most suitable variety for Nyasaland, at present, appears to be Ceara, which occupies 4,403 acres. The rubber produced is of satisfactory quality, having realized, in experimental quantities, 8*s.* 10*d.* per lb. in London. The total export of rubber during the year was 27,144 lb. —an increase of about 11,000 lb. on that of the preceding year. Notwithstanding the success of Ceara rubber, the opinion is given that the present doubts as to the length of life of the trees and their power to recuperate do not justify its cultivation on a large scale, so far. A matter of interest is that rubber has been planted by natives near sixty-six villages in West Nyasa, from seed distributed during the year. Of other exports, the amount of maize was 2,000 tons: this is the first occasion on which this product has been shipped; that of chillies was 119,126 lb., which is an increase of about 72,000 lb. on the shipments of 1908-9.

The number of Eucalyptus and Mlanji cypress trees (*Callitris Whytei*) raised from seed for transportation were 200,000 and 165,000, respectively. In regard to the latter, the native forests supply all the wood for Government buildings, at a cost of about one-eighth of that of the imported pitch pine.

Importations of good breeds of cattle are being made for the purpose of improving the stock in the Protectorate, which amounts at present to 57,658 head, of which 46,509 are owned by natives. In this connexion, it is of interest that, given satisfactory markets, it is possible that Nyasaland may become an important pastoral country.

Nature Knowledge and Elementary Hygiene in British Guiana.

The report of the Inspector of Schools, British Guiana, for 1909-10, shows that, although nature teaching is not compulsory in the elementary schools in the Colony, it is taught in all of these. Blackie's *Tropical Reader* and *Nature Teaching* are recommended as the books to be used in connexion with the subject, and the rule has been made that from April 1, 1910, parts of the latter publication must be presented for examination in all standards from the second upward, if a fair grant is to be earned. Improvements are called for in the box and pot cultivation carried out in schools which do not possess gardens. As regards experimental work, it is expected that some of the apparatus mentioned in *Nature Teaching* will be introduced into the schools, in order to diminish the tendency toward the learning of facts from the book, without understanding them. Encouragement is given, as well, to the collection of natural history specimens and the making of drawings.

Elementary hygiene has now been taught to the pupils in the three upper classes of the primary schools for nearly six years. It is stated that there is usually an intelligent interest in this subject, on the part both of the teachers and the children; although, as is the case with the subject just mentioned, there is a great tendency toward the giving of mere book teaching. The hope is expressed that the effect of the work which is being done will be to bring the principles of hygiene into closer connexion with the matters of the daily life of the pupils.

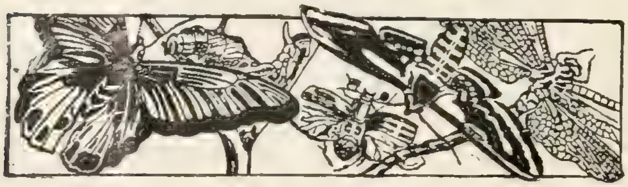
During the year 1909-10, lectures on agricultural science and hygiene were delivered to elementary taachers, in each of the three counties. The number of teachers attending these was 102, of whom 54 presented themselves for examination in the subjects, with the result that 25 passed in agriculture, 32 in hygiene, and 21 in both subjects. The courses of lectures are given in two parts, with an interval of about three months between the parts. In the past, the lectures have been weekly; they will be given daily, until the completion of the course, in future, as a matter of general convenience.

Decorticating Machinery.

References have been made from time to time, in the *Agricultural News*, to various fibre machines (see especially Vols. VIII, p. 293; and IX, p. 156). The *Queensland Agricultural Journal*, for August 1910, gives information concerning several larger types of these machines, such for instance as are capable of cleaning from 40,000 to 150,000 sisal leaves per day of ten hours, with six men to attend to the machinery. The examples of these that are mentioned are the Prieto, the Todd, the Finnigan-Zabriski, and the Ajax which is of British make. These are not suited to small plantations, although an instance is given of a Finnigan-Zabriski machine, which is producing 1 ton of marketable fibre daily, in use on an estate of 60 acres. The cost of the best machines is as much as £600, excluding freight and other expenses. They are also costly in that the power for driving them ranges from 50 to 70 h.p.

Efforts are being made toward the production of lower-priced automatic machines. One of the latter is the Irene No. 51, made by the Prieto Company, which requires 12 h.p. and which has an output of 20,000 to 30,000 cleaned leaves per day. The cost of this is £300, f.o.b. London.

The same journal states that, of the British made machines, the automatic Ajax is stated to be a perfect, low-priced machine. This does not require more than 15 b.h.p., as it is single-drum machine, with an output of about 2,500 to 3,000 leaves per hour. It weighs 2½ tons net, and like the Irene, it is suitable for plantations having an area up to 200 acres; it produces ½- to 1 ton of fibre per day, according to the character of the leaves. The machine is made by the Alma Machine Works, Liversedge, Yorkshire, and sold by Messrs. Walter Griffith & Co., 6 Crosby Square, London.



INSECT NOTES.

PLANT BUGS INJURIOUS TO COTTON BOLLS.

At different times during the past few years, cotton growers in the West Indies have observed that a considerable number of developing bolls have dropped from the plants, and that others have failed to develop properly, remaining in a dry and distorted condition attached to the plant, through the time required for the process of ripening, and often long after the crop was picked.

The causes of the loss of bolls have been the subject of investigation from time to time, on the part of the officers of the Imperial Department of Agriculture, in response to requests from planters, who desired to know what they were, in order to be able to prevent further loss.

In this connexion, anthracnose, boll rot and black boll have been investigated, and have been found to be responsible for at least a portion of the injury.

In a paper on Cotton Stainers (see *West Indian Bulletin*, Vol. VII, p. 76), the Entomologist on the Staff of the Imperial Department of Agriculture states that it is difficult to say exactly what the nature of the injury to cotton by cotton stainers is, and that the whole question of the nature and amount of the injury to the cotton plant, seed and fibre, might well form the subject of an extended investigation. The writer believes, however, that cotton stainers injure young cotton bolls by sucking the sap, and thus lessening the quantity of the yield of fibre, and perhaps also affecting its quality; that they cause a certain amount of drying up of the pod; and that they check the growth of the pod and of the cotton inside it. In addition to these injuries, the seed is often damaged to such an extent as to interfere with its power of germination, and greatly to reduce the amount of oil that may be extracted from it.

The Bureau of Entomology of the United States Department of Agriculture has recently issued a bulletin (No. 86) entitled *Plant Bugs Injurious to Cotton Bolls*, by Dr. A. W. Morrill, in which field observations and laboratory experiments are shown to indicate a considerably greater injury to cotton bolls from this cause than has been suspected in the past. The insects referred to by the term 'plant bugs' in this bulletin include several of the Hemiptera-Heteroptera, among which are cotton stainers and other species of plant-feeding bugs, of which near relatives are to be found in all the West Indian islands.

The West Indian insects which may be regarded as likely to cause the same kind of injury as those mentioned as plant bugs in Bulletin 86 are the cotton stainers (*Dysdercus* spp.), the green bug (*Nezara viridula*), the brown bug (*Edessa meditabunda*), the leaf-footed bug (*Leptoglossus phyllopus*), which are more or less familiar to cotton planters in these islands. There are also several others less commonly observed.

Dr. Morrill states that it is always difficult, and sometimes impossible, to determine from the appearance of the outside of the boll, the damage done by the feeding of these insects. On the inside of the carpels forming the boll, however, there will be found, in the fresh, growing boll, discoloured spots surrounded by watery or blister-like, bright-green areas contrasting distinctly with the light, dull-greenish background. In many cases, particularly in bolls three-quarters grown, or more, these blister-like areas increase to a diameter of 4 to 5 mm.; but in other cases, more especially in small, rapidly growing bolls, a physiological reaction in the form of a proliferation of tissue takes place, causing slight swellings on the smooth inner surface of the carpel.

It should be borne in mind that the rostrum so plainly visible in the plant bugs is not inserted into the plant tissue, but that it encases the very slender setae, which form the real organ for extracting the juice from plants. These setae make such a minute puncture that it is practically impossible to discover this on the outside, or to trace its course through the carpel. On the inside, the marks or the slight swellings mentioned above, will often indicate the point at which the setae came through the carpel and entered the lint- and seed-mass in the locule. These spots, or swellings, will often be seen to have definite relation to the location of a stained spot in the lint, and may generally be found in those bolls which have failed to open properly, especially on those carpels which cover locules in which the development has been entirely arrested, causing shrivelled, distorted bolls.

It is believed by Dr. Morrill that stained cotton is largely produced by the puncturing of the boll by these plant bugs, and he does not think that the excrement of stainers or other insects has much influence in producing stained cotton.

The injuries to the boll which result in dropping, abortive or distorted development, and stained cotton, have been observed repeatedly in fields where plant bugs have been abundant; but in fields and localities where these have been absent, this form of injury was not noted. The trials in cages have given the same results: those plants on which plant bugs were caged produced bolls which showed the injuries mentioned, while those to which no plant bugs had access were practically free from such injuries.

A considerable portion of Dr. Morrill's observations was made on a plant bug in Mexico known as the conchuela (*Pentatoma ligata*, Say.), and he states definitely that, so far as that insect is concerned, the damage to the cotton is not the result of the voiding of excrement on the lint and unopened bolls, although that is the popular belief in Mexico.

Speaking of the staining of the lint by the stainer (Dysdercus), Dr. Morrill mentions observations in Texas to the effect that this is due to the attack by the stainers: 'on the immature bolls, and on the seed at the time of opening, the brownish-yellow colour being derived from the injured seed rather than from the excrement of the bugs.' The staining of the cotton is found to be most intense next the seed, and it has been noticed that sometimes cotton fibres are stained at their bases, where they are attached to the seed, while toward their tips, away from the seed, they are free from stain.

The cotton stainer is counted the most serious pest of cotton in Florida, and it occurs to some extent in adjoining states.

This brief account of recent observations on the plant bugs and their injuries to cotton bolls should be an incentive to West Indian cotton growers to note more carefully the occurrence of these insects in the cotton fields, with especial reference to the relative abundance of plant bugs and bolls injured in the manner indicated, for it is possible that, as a result, more definite knowledge may be forthcoming, in regard to the cause of boll-dropping, deformed and undeveloped bolls, and stained cotton.

OUR BOOK SHELF. NOTES and REVIEWS.

INDIAN INSECT LIFE. By H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Entomologist, Imperial Department of Agriculture for India; assisted by F. M. Howlett, B.A., F.E.S., Second Entomologist, Imperial Department of Agriculture for India. *Thacker, Spink, & Co., Calcutta and Simla.*

This large volume is well printed on paper of good quality and the illustrations are particularly attractive, the full page plates being coloured reproductions of photographs, while the text figures are in part from photographs and in part from drawings.

The book is designated A Manual of Insects of the Plains (Tropical India), and is intended for the use of all students of Indian entomology. In the authors' preface, it is stated that the work has been prepared from the notes, observations and specimens accumulated during the six years since the Agricultural Research Institute at Pusa was established, and that the volume is largely the product of the author's spare time and scanty holidays. Acknowledgement is made of the work of Mr. Howlett, and of the assistance received in the matter of notes and specimens; there is especial reference in this connexion to the printing of the coloured plates, which is, indeed, carried out excellently.

The scheme of classification used in this book divides the insects into eight orders, as follows: Aptera, Orthoptera, Neuroptera, Hymenoptera, Coleoptera, Lepidoptera, Thysanoptera, and Diptera. The relative importance of the families is brought out in the tabulation of the scheme: by the method of printing, the best known and most important families occurring in India appear in dark-faced type; those families which are represented by Indian insects, but which are but little known, appear in ordinary type; while those which are not known to be represented in the Indian fauna appear in small italics.

In the consideration of the insects, the economic aspect of the habits of each species is brought out, where this can be done; and much valuable information as to the feeding habits, food-plants or hosts and life-history is given, with mention in many instances of parasitism and natural enemies. Paragraphs on collecting give information as to when and where to collect, and suggest methods which may be found successful in different situations.

Interspersed throughout the book are chapters on entomological matters of interest to the student and the lay reader. The subjects of some of these chapters are as follows: Where Insects Live, Cosmopolitan Insects, Deceptive Colouring, Attraction to Light, Relative Duration of Life, Size of Insects, Insects and Flowers, Insects as Food, Migration, How Insects Protect Themselves, Blood-Sucking Insects, and Song in Insects.

A very useful feature is the index of Indian plants, where plants mentioned in the text are referred to under the generic name, and the English and the Indian names in the case of plants which have both these common names. This makes it very easy to ascertain the insects which have been found on plants; while the text states, with regard to each insect or group of insects, what is known of food-plants and feeding habits.

The book is very well written, and the technical knowledge and general information are presented in attractive form. The ordinal and family characters seem to be well arranged, though there are not as many tabular analytical keys for aiding in placing insects in their families, as might be expected.

The work furnishes a broad substantial basis for the future study of entomology in India, and when it is remembered that the great amount of labour recorded therein has been accomplished in a period of six years, the energy and ability of the authors are realized, and at the same time the enormous scope of the science of Entomology in India becomes apparent.

FEEDING VALUE OF SOY BEAN CAKE.

Last winter, experiments with soy bean cake as a concentrated food for fattening bullocks were carried out by the East of Scotland College of Agriculture, on a farm in Forfarshire and another in Fifeshire. The fattening of cattle in winter is an important business in those counties, and though the chief materials in the diet are home-grown roots with straw or hay, cake or meal of some sort is added freely in the last few months of the fattening process. Linseed cake is the favourite material for the finishing period, but it has become so dear that a suitable substitute would be welcomed, and it was because of its possibilities in this direction that the advent of soy bean cake excited such keen interest. The basal ration in the experiments consisted in one case of 85 lb. of swedes, $8\frac{1}{6}$ lb. of oat straw (which was partially replaced during the last four weeks with hay), and 4 lb. of Bombay cotton cake, reduced in the latter half of the experiment to $3\frac{1}{2}$ lb. per head per day; and in the other 100 lb. of swedes, 8 lb. oat straw, and 4 lb. Bombay cotton cake throughout the whole period of the experiment. In the first case, the experimental ingredients were (1) linseed cake, (2) soy bean cake (6 per cent. of oil); and (3) a specially manufactured compound cake comprising seven-fifteenths soy bean cake, six-fifteenths soy bean meal, and one-fifteenth each Indian corn and locust bean meal. The allowance in each case was 2 lb. per day to begin with, increased gradually to 5 lb. The linseed cake lot grew more than the other groups, but did not finish so early. Notwithstanding the higher price, linseed cake gave the largest profit, with the soy bean cake second. As regards the quality of the meat, lot three (compound cake) were declared by the butcher to be superior to lot one (linseed cake); no mention is made of lot two.

In the second experiment, linseed cake and soy bean cake were used as before, but the third lot received soy bean cake containing 11 per cent. of oil. In this case, lot two gave clearly the best result, with lot three (11 per cent. of oil) second, and lot one (linseed cake) third, the difference between one and two amounting to about 11*s.* per head. The interesting point in this experiment is the superior results from 6 per cent. as compared with 11 per cent. of oil. It would seem that it is the quality of the soy bean oil rather than the quantity of it that influences the results, as at both farms the smaller quantity gave the best returns. The general conclusion arrived at on the basis of these trials, is that soy bean cake is a perfectly safe food when used with discretion, but that notwithstanding its high analysis, the ordinary brand at £6 15*s.* per ton seems to be a dearer feeding stuff than good linseed cake at £9. (From *The Field*, Vol. CXVI, p. 801, October 22, 1910.)

GLEANINGS.

It is reported that the first official estimate of the present rice crop in Japan places it at 48,725,597 koku (1 koku = 4·96 bushels). This is a decrease of 7 per cent. from that of last year, and 0·7 per cent. from the crop of a normal year.

The most recent estimate places the area under cotton in Eastern Bengal and Assam at 99,300 acres. A favourable season has been experienced, and a good yield is expected. The total area under rice, this year, is 11,794,700 acres, which is 132,200 acres less than that of last year.

The report of the Director of Agriculture of the Federated Malay States, for 1909, shows that the number of rubber estates in that colony was 377, the total area of these being 500,431 acres, of which 196,953 acres have been planted up. The output of rubber during the year was 6,083,493 lb., as compared with 3,190,000 lb., in 1908.

According to a recent official return, there are at the present time about 104,000 acres of land in Korea prepared for the cultivation of cotton. It is said, however, that the seed deteriorates, with the result that a fair quality of cotton can only be produced by importing seed from America every fourth year. (The *Textile Mercury*, October 29, 1910.)

The *Chamber of Commerce Journal* for November 1910, states that it is proposed to hold an International Exhibition in Winnipeg, in 1914. About £500,000 has been subscribed already in Winnipeg, for the purpose, and the Government of the Dominion of Canada has been asked to contribute a similar sum.

Information has been received that Mr. Fred Kent of Mount Rich, Grenada, has imported a Castile jack donkey, slightly over 15 hands in height, about three years old and strongly built, with the object of entering upon mule breeding on a fair scale. To the same end, Mr. Kent is now importing three or four large mares from Montevideo.

It is announced, for general information, that Mr. Tom Manning, of the Pierhead, Barbados, has imported from England pedigree rabbits of the Flemish Giant breed, the parents of which have won cups and various prizes at the Crystal Palace and other shows. The weight of the animals, when fully grown, averages 16 lb.

Mr. Edgar Tripp, Secretary of the Agricultural Society of Trinidad and Tobago, has kindly pointed out that the reference given in the *Agricultural News*, Vol. IX, p. 346, to Dr. Gough's paper on frog-hoppers, in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, is inaccurate. This should be to Vol. X, part 9, instead of to Vol. VIII, part 9, of that publication.

A note in the *Experiment Station Record* for August 1910, p. 153, calls attention to a disease of the ornamental plant *Euphorbia pilulifera*, which causes the premature shedding of its leaves. The disease has been shown to be due to an organism, *Leptomonis davidi*, n. sp., belonging to the group Flagellatae which, curiously enough, lives in the latex of the attacked plants.

The *Geographical Journal* for last month contains the interesting statement that Professor de la Torre, of the University of Havana, has found the remains of a fossil mammoth, Amblyrhiza, in St. Martin. This discovery is of the greatest importance, in relation to the study of the past history of the continent of which the West Indian islands are supposed to have once formed a part.

The *Cyprus Journal*, for October 1910, contains a reprint of parts of the Order in Council No. 276, Cyprus, 1897, by which the importation of plants, seeds, etc., into that island is regulated. In relation to certain stated countries, this affects raw fruits and vegetables, all living parts of plants, all dry parts of plants, packing material, and hay and straw. Special regulations are in force in regard to planting material from countries infected with Phylloxera.

In an address given before the Committee of the African Trade Section of the Liverpool Chamber of Commerce, on October 3, 1910, it was pointed out by Sir Rubert Boyce, F.R.S., that yellow fever has existed in West Africa for many years, but that it had always been taken for malaria. It was further stated that the realization of this fact was leading to the adoption of increasingly energetic measures in connexion with mosquito control in that part of the world.

No. B. 554 of the *Proceedings of the Royal Society*, published recently, contains a paper describing a method by which the presence of formaldehyde in plants can be detected even in minute quantities, either combined or free. The investigations with the aid of this have shown that formaldehyde is combined with chlorophyll in green plants, thus affording a possible explanation as to how the supply of that substance is obtained for building up sugars in the leaf.

In regard to the forthcoming International Rubber Exhibition (see *Agricultural News*, Vol. IX, pp. 60, 156, 172, 220 and 284), the *India-Rubber Journal* for October 31, 1910, states, in regard to the shield that is being offered by the proprietors of this paper (*Agricultural News*, Vol. IX, p. 220), that there is no entrance fee for this competition, and that ample space for exhibits will be provided free. No more than three entries, by any one producer, are allowed in the competition, and the samples must weigh not less than 10 lb.

A report from the Superintendent of Agriculture, Grenada, states that, at the last general meeting of the Agricultural and Commercial Society, a deputation was appointed to approach His Excellency the Governor with a view to impressing upon him the advisability of providing facilities for handling cotton in that island. As a result, information required in connexion with the erection of a ginnery has been obtained, with a view to giving these facilities. The present area of cotton cultivation in Grenada is 40 acres, and such recent developments should lead to an extension of this.

STUDENTS' CORNER.

DECEMBER.

Second Period.

Seasonal Notes.

At this period of the year, in places where lime products are prepared, opportunities will have been afforded for making observations in connexion with such preparations. Note the way in which the fruit is crushed, and the care that is taken in relation to keeping the mill, taysches and stills in good order. Where it is possible, the methods of preparing raw and concentrated juice for export should be compared, and a careful study made of the manufacture of citrate of lime. (See, in this connexion, the *West Indian Bulletin*, Vol. VIII, p. 167.) What advantages and disadvantages does the manufacture of citrate of lime possess, when compared with that of concentrated juice? In the latter, how would you ascertain the loss of citric acid that takes place during the process? What precautions may be taken for the purpose of minimizing this loss, as far as possible? How is the essential oil of limes recovered, when citrate of lime is made? What do you know of the écuelle process for obtaining lime oil? From which can the largest amount of oil be obtained—the green fruit, or the ripe? For what purposes are lime juice, citrate of lime, and lime oil employed in commerce?

The termination of the hurricane season has made it safe to undertake the grafting of cacao, and useful, practical information in connexion with the matter should have been obtained, by this time. What varieties are best suited to the conditions with which you are familiar? What objections exist in regard to the propagation of cacao from seed, under ordinary conditions? A careful watch must be kept for outbreaks of diseases in cacao cultivations. Make a list of these, and place against each its appropriate method of treatment. What precautions should be taken in regard to wounds made in cacao trees, either accidentally, or for any special purpose? Particular care of cacao that is being established is required at the present time. A constant watch on the condition of this is needed, especially in regard to the provision of the proper amount of shade; if this is becoming too dense, it should be thinned, from time to time. What signs would you expect to be exhibited by a cacao plant in relation to the existence of (1) too much shade, (2) too little shade? What circumstances are likely to occur, if the shade is too dense? State the differences in principle and practice that exist between the shading of cacao and that of limes.

Where cocoa-nuts are grown in any quantity, the palms should be constantly examined for signs of bud-rot. The chief of these are the drooping of the outer leaves of the 'cabbage', in some cases; an unhealthy appearance of these; the blackening of the flower spikes; and the dropping of the young fruits. Examination of the central tissue of the crown shows that this has become largely reduced to a soft, putrid condition. (See *West Indian Bulletin*, Vols. VI, p. 307; IX, p. 379; and *Agricultural News*, Vols. IV, pp. 299, 369; VI, p. 75; VIII, pp. 276 and 373.)

Among the minor industries in the islands, that of onion-growing has attained to more or less importance, in one or two cases. How is land prepared for the growth of this crop? Give an account of the methods that may be employed for planting, as well as of the cultivation to be given during the time that the plants are developing. Why is it expedient for the crop to be reaped early? State what yield per acre may be expected, under the conditions with which you are familiar. What ways of storing the crop may be adopted, where it is necessary for this to be done? To what diseases are onions liable (1) in the field, (2) in storage, and what precautions may be taken against these? Give an account of the varieties of onions with which you are familiar. As regards your district, what size and kind of onion is most suitable (1) for export, (2) for local use? How are correct methods of planting related to the production of a good, marketable onion? Discuss the effects of planting too closely, in relation to this matter.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the meaning and uses of transpiration in plants?

(2) Describe and compare the root systems of monocotyledons and dicotyledons.

(3) Discuss the advantages and disadvantages of making up farmyard manure under shelter.

INTERMEDIATE QUESTIONS.

(1) Give mention of crops that are likely to benefit by the visits of bees and other insects at the time of flowering of the plants, and state the way in which the benefit is received.

(2) Write an account of the best methods for curing and preparing ginger for shipment.

(3) Draw up a scheme for the classification of different kinds of fruit, following broad principles.

FINAL QUESTIONS.

(1) Describe the means by which the plants are protected from an excessive loss of water, in the case of one important crop.

(2) Write an account of as many plants as you know of which produce starch in commercial quantities.

(3) Give a description of the methods of selecting maize for (a) increase of yield, (b) increase of feeding value.

Cotton Seed Importation into West Africa.—The Board of Trade has received a copy of an Order-in-Council (No. 8 of 1910), dated June 10, prohibiting, under the 'Destructive Pests Ordinance, 1910', the importation of cotton seed into the Colony or Protectorate of Southern Nigeria, except through the Port of Lagos.

The Order-in-Council further provides that no cotton seed shall be so imported that has not been disinfected before shipment, in a manner approved by the Director of Agriculture, and further, that all cotton seed imported shall be accompanied by a certificate to the satisfaction of the Director of Agriculture, certifying that such disinfection has been duly and properly carried out.

All cotton seed arriving without a certificate, or which is not to the satisfaction of the Director of Agriculture, shall be destroyed or landed at such place as the Director of Agriculture may direct, and there disinfected under his supervision, at the expense of the importer. (The *Textile Mercury*, September 17, 1910.)

FUNGUS NOTES.

MISCELLANEOUS FUNGI RECENTLY EXAMINED.

Specimens of three interesting fungi have been received recently at the Head Office from Mrs. Patterson in St. Vincent. They consisted of smut of Guinea corn (*Ustilago sorghi* (Link.) Pass), leaf spot of beet due to *Cercospora beticola*, Sacc., and rust of grape leaves (*Uredo vitis*, Thümen).

USTILAGO SORGHI. This fungus attacks the flowers of several species of the genus Sorghum, and of cultivated sorghums such as Guinea corn (*Andropogon Sorghum*, var. *vulgare*). It occurs in Europe and America as well as in the West Indies. The parts affected are the ovary and stamens. The former becomes swollen and projects somewhat beyond the surrounding glumes or floral leaves. It takes the form of a round-ended cylinder, white at the base and brown from the middle upwards. The brown colour is due to the fact that the upper part of the ovary has been transformed into a sac containing a mass of the spherical brown spores of the fungus. After these spores are ripe, the wall of this sac ruptures, and the spores are shed freely into the air. When this happens, it is found that there is a tapering cylinder of plant tissue which has grown upwards along the axis of the ovary from its base. This cylinder terminates in a blunt point before it reaches the top of the sac. In rare instances, it may be branched once or twice, and is then of a somewhat irregular shape. The stamens, when attacked, are rendered entirely unrecognizable.

FIG. 37. USTILAGO SORGHI. Hypertrophied Ovule attacked by the Fungus.

FIG. 38. USTILAGO SORGHI. Columella from the interior of a diseased ovule.

All the florets of any one head are usually found to be infected; moreover, since the ovary is transformed in the manner already described, it naturally follows that diseased plants produce no seed. The disease does not, however, appear to be of any great importance, as no very large number of plants is usually infected at any one time. For this reason no remedial measures appear to have been tried.

When the spores are placed in a drop of water, they germinate and give rise to a short tube or promycelium, which is usually simple, but may occasionally be branched. According to Prillieux, this does not form sporidia, as is usually the case in members of this genus (see *Agricultural News*, Vol. IX, p. 59), but is divided up by cross walls into a few cells. Eventually, the cells separate from one another, forming short, cylindrical, spore-like rods, which are capable of germinating and producing the fungus again. According to Brefeld, the brown spores will only germinate in a nutritive solution, when they give rise to a promycelium and small lateral conidia, in the usual way. The first form of germination is, however, more probably that occurring under natural conditions, as, in such circumstances, the spores would not be able to obtain artificial culture media in which to germinate.

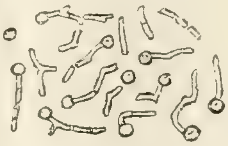


FIG. 39. USTILAGO SORGHI. Spores germinating in water.

CERCOSPORA BETICOLA. This fungus attacks severa different varieties of the beet in Europe and America. The specimens sent were the leaves of the red garden variety which are usually affected to some extent, though not as a rule very seriously. In moist seasons, considerable damage may be inflicted on the sugar beet, but usually the extent of the injury does not necessitate the adoption of preventive measures. Where the damage became extensive, spraying with Bordeaux mixture was found to be effective.

The disease first appears in the form of small brown spots, which extend until they reach a diameter of about ⅛-inch or more. They then consist of a circular patch of grey dead tissue, bounded by a red brown border. In some instances, the spots become numerous, and run into one another, thus covering a large proportion of the leaf surface. In bad cases, the leaves blacken and dry up; as they do so they tend to stand more upright, and frequently become curled or rolled, thus presenting a characteristic appearance.

The conidiophores of the fungus break through the epidermis in tufts, generally on the under surface of the leaf. They are short, with cross walls, often somewhat knotted at the tip, and of a brownish colour. Each bears a single somewhat needle-shaped conidium. The conidia are long, multicellular, cylindrical and hyaline, frequently drawn out into a point at the end. They germinate very freely, and in a damp year the spots on the leaves increase rapidly. In Germany, the fungus is said to attack the leaf stalks, bracts and pods, as well as the leaves, and it seems possible that infection may be carried by means of spores on the seeds.

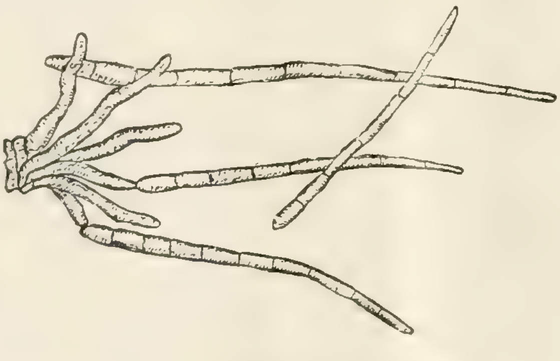


FIG. 40. CERCOSPORA BETICOLA. Conidiophores and Conidia.

UREDO VITIS. This fungus forms yellow, powdery pustules on the leaves of grape vines, usually on the under side. It was first reported from the United States of America, where, however, it did not cause any very serious damage, and subsequently disappeared. In 1879 it appeared in Jamaica, where it assumed the form of a serious disease, and attracted considerable attention during that and a few subsequent years.

The fungus was investigated by Massee, who identified it,

and stated that it was the same as *Uredo vialae*, Lagerh. It forms pear-shaped or broadly elliptical, warty, orange spores of a moderate size. These are produced at the ends of fertile hyphae, which break through the epidermis in pustules. The fertile hyphae are accompanied by curved, orange, sterile hairs. According to Cockerell (*Special Publications of the Institute of Jamaica*, No. 3, p. 103), Massee found that the cluster cup, or aecidial form of the fungus, also occurred on the vine. By way of explanation, it may be stated that most of these rust fungi have four different forms of spores—aecidiospores, uredospores, teleutospores, and sporidia, the last arising directly from the germination of the teleutospores. Frequently the aecidiospores are formed on one host plant, and when they germinate are only capable of infecting a different host, on which the uredo- and teleutospores are formed. (See *Agricultural News*, Vol. IX, pp. 142 and 158.) In the case of *Uredo vitis*, only the uredo- and aecidiospores are known, and both of these are produced on the vine, so that it is unlikely that infection is carried to vine leaves from any other host plant. Cockerell (loc. cit.) calls attention to an interesting point in connexion with the country from which this fungus may have come, namely this: whether it originated in the United States, and spread from there to the West Indies, or if it existed for some time in the West Indies, without being noticed, and then spread to the States, from which it was first reported. In the first case, it would appear that a fungus, which was fast losing its vitality under its native conditions, was enabled to regain vigour under the warmer and damper conditions in these islands; while in the second, the fungus can never have been very vigorous when imported into the United States, but was still able to cause considerable damage in the West Indies. The first alternative seems the more probable, since the fungus appears to have lost vigour in the West Indies, of recent years. When remedial measures are required, the following may be recommended. Where one or two vines in a garden are badly attacked, it would be advisable to pick off, and burn, dead or badly infected leaves, and to spray the vines with Bordeaux mixture. The same precautions would be found useful in the case of one or two other diseases, such as mildew, which occasionally attack grape vines in the West Indies.

CIGAR TOBACCO GROWING IN PENNSYLVANIA.

SEED BEDS. The selected seed is first planted early in the season in a warm seed bed, and transplanted when the plants have attained proper maturity, and the soil and weather have become suitable for their vigorous development.

The seed is usually sown about the first of April. Tobacco seed is considerably smaller than clover seed, and is therefore very difficult to distribute evenly. A convenient way of sowing is to stir a tablespoonful of seed into a 2-gallon sprinkling can full of water, and then sprinkle the water evenly upon the bed. An even tablespoonful of seed will sow about 1 square rod.

Many growers mix the seed with a convenient quantity of dry woodashes to make a bulky mixture, and then sow the mixture.

As soon as the seed is sown, the muslin covering is stretched over the bed and is removed only to water the soil and to pull the weeds. In dry weather, it is necessary that the beds be watered at least three or four times a week. Care must be taken that too much water is not used, since excessive moisture tends to favour various fungus diseases.

PREPARING THE SOIL. In order to retain the soil moisture, the tobacco land is ploughed early, and an occasional harrowing given it up to the planting time. Before planting, it is cultivated thoroughly, so as to make the soil as loose and mellow as possible. Stable manure is the chief fertilizer, horse manure being considered especially valuable, and this is sometimes ploughed under, and sometimes applied on the top. Some growers state that since they have discontinued the use of cow manure and have used only horse manure, their percentage of 'calicoed' tobacco has been less. A common dressing is 10 loads per acre. The use of commercial fertilizers is increasing, but they are not used as extensively as in Connecticut. Formerly the commercial tobacco fertilizers offered contained potash in the form of chloride, with the resultant danger of injuring the burn of the cigar. Now, however, the sulphate is used, and sometimes the carbonate. Tobacco stems are frequently bought from the manufacturers and used as a fertilizer.

After the plants have grown to the height of 5 to 6 inches and have developed from five to seven leaves, they have reached a desirable stage for transplanting. Before the plants are pulled from the seed beds they should be thoroughly watered, in order that the small roots may not be torn off, and that as much soil as possible may adhere to them.

In drawing the young plants from the beds for transplanting, they should be taken up one at a time, and care should be exercised to see that all diseased and injured plants are discarded.

TRANSPLANTING. The plants are set out in rows, either by hand, or with a planter. They are set from 18 to 30 inches apart in the rows, and the rows are from 36 to 48 inches apart. The distance apart at which the plants are set depends upon the strength of the soil, and also upon the variety and character of the tobacco. The plants of the Pennsylvania broad-leaf tobacco are set from 24 to 30 inches apart in the rows, and the rows are from 36 to 42 inches apart.

Some replanting is always necessary, and this is done by hand, usually at a time when the weather conditions are favourable for starting plants.

CULTIVATION. The field should be cultivated within eight or ten days after the plants have been set. Just recently, there has been placed upon the market a machine known as the tobacco hoer. This machine is drawn by two horses, and carries a driver and another man to operate the hoes. It is a great labour-saving device, and works the soil as thoroughly as does the hand hoe.

The essential thing in cultivating is to keep a mulch on the surface of the soil, and hence the cultivation must be repeated after each rain. The hand hoe is used very extensively, and also to good advantage, since it permits cultivation closer to the plant than does the ordinary horse-power machinery. In cultivating tobacco, the soil is always worked toward the plant, and not away from it. The period of cultivation ceases when the leaves have become so spread out that a horse can no longer pass between the rows without damaging the plants. (From *Farmer's Bulletin* 416 (October 1910), of the United States Department of Agriculture.)

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados by the R.M.S. 'Berbice', on November 29, 1910, from St. Lucia, after a visit to that Presidency for the purpose of conferring with His Honour the Administrator on official matters.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, November 8, 1910; Messrs. E. A. DE PASS & Co., October 28, 1910.

ARROWROOT—St. Vincent, $1\frac{15}{16}$*d.* to 3*d.*
BALATA—Sheet, 3/4; block, 2/4 per lb.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 50/- to 54/6; Jamaica, 49/- to 54/-.
COFFEE—Jamaica, 50/- to 120/-.
COPRA—West Indian, £27 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 48/- to 51/- per cwt.; low middling to middling, 52/- to 56/-; good bright to fine, 57/6 to 62/6.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/1; concentrated, £18 5*s.*; Otto of limes (hand pressed), 5/6 to 5/9, nominal.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{16}$*d.*; fair, $2\frac{3}{16}$*d.*; good, $2\frac{5}{16}$*d.* per lb.
RUBBER—Para, fine hard, $6/0\frac{1}{2}$, fine soft, 5/2; fine Peru, 5/9 per lb.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/6 to 18/6; Muscovado, 11/6 to 14/-; Syrup, 11/3 to 11/6; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., November 11, 1910.

CACAO—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, $11\frac{1}{4}$c. to $11\frac{1}{2}$c.; Trinidad, $11\frac{1}{2}$c. to $11\frac{3}{4}$c. per lb.; Jamaica, no quotations.
COCOA-NUTS—Jamaica, select, \$35·00; culls, \$20·00; Trinidad, select, \$35·00; culls, \$20·00 per M.
COFFEE—Jamaica, ordinary, $11\frac{1}{4}$c.; good ordinary, $11\frac{3}{4}$c. to 12c.; and washed, up to $13\frac{1}{2}$c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—No quotations.
GRAPE FRUIT—\$2·50 to \$3·25 per box.
LIMES—\$4·50 to \$5·00.
MACE—39c. to 42c. per lb.
NUTMEGS—110's, $9\frac{3}{4}$c. to 10c. per lb.
ORANGES—Jamaica, \$1·50 to \$2·50 per box.
PIMENTO—$3\frac{3}{4}$c. per lb.
SUGAR—Centrifugals, 96°, 3·86c. per lb.; Muscovados, 89°, 3·36c.; Molasses, 89°, 3·11c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 26, 1910.

CACAO—Venezuelan, \$11·25 per fanega; Trinidad, \$10·80 to \$11·30.
COCOA-NUT OIL—\$1·05 per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$3·70 to \$3·75.
ONIONS \$4·00 to \$4·25 per 100 lb.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$2·00 to \$2·25 per 100 lb.
RICE—Yellow, \$4·30 to \$4·35; White, \$4·70 to \$4·75 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., December 2, 1910; Messrs. T.S. GARRAWAY & Co., December 3, 1910 Messrs. JAMES A. LYNCH & Co., November 28, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$22·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$14·50 per 100 lb. scarce.
HAY—\$1·20 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·75 to \$3·50 per 100 lb.
PEAS, SPLIT—\$6·25 to \$6·50 per bag of 210 lb.; Canada, \$3·45 to \$3·50 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·50 to \$3·25 per 160 lb.
RICE—Ballam, \$4·90 to \$5·30; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, November 26, 1910; Messrs. SANDBACH, PARKER & Co., November 25, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$9·00 per 200 lb., wanted	\$9·00
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c. per lb.	12c. to 13c. per lb.
Jamaica and Rio	16c. per lb.	$16\frac{1}{2}$c. per lb.
Liberian	$9\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$3·80 to \$4·00 per bag of 168 lb.	\$3·80 to \$4·00 per bag of 168 lb.
Green Dhal	\$4·00	——
EDDOS—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5c. to 6c.	6c.
PEAS—Split	\$6·00 to \$6·25 per bag (210 lb.)	\$6·50 per bag, (210 lb.)
Marseilles	\$4·25	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	\$2·30	\$2·30
Lisbon	——	No quotation
POTATOS-Sweet, Barbados	\$1·32 per bag	——
RICE—Ballam	\$4·80 to \$4·90 per 175 lb.	\$4·80
Creole	\$4·40 to \$4·75	\$4·35 to \$4·75
TANNIAS—	\$1·92 per bag	——
YAMS—White	\$3·00	——
Buck	\$2·40	——
SUGAR—Dark crystals	\$2·20 to \$2·25	None
Yellow	\$2·80 to \$3·25	\$2·65 to \$2·80
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$3·50 to \$5·50 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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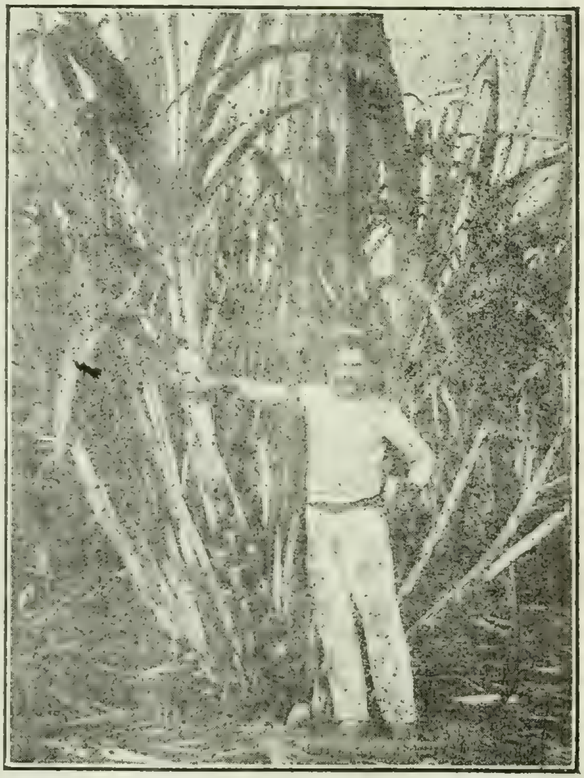

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. IX. No. 226. BARBADOS, DECEMBER 24, 1910. PRICE 1*d*.

CONTENTS.

The Work of Earthworms in the Soil.

SINCE the publication, by Darwin in 1881, of *Formation of Vegetable Mould through the Action of Worms*, in which he showed the importance of the work of earthworms in forming vegetable mould in soils, the usefulness of these animals to the agriculturist, more particularly in colder climates, has been fully recognized. The work of various investigators has indicated that they increase the fertility of the soil through acting as cultivators, and that they may actually take part in the production of plant food by decomposing organic matter in the soil more quickly than this can be done by micro-organisms in it. The first of these effects has been proved conclusively. In regard to the second there has always been uncertainty.

In order to find out if the presence of earthworms in the soil increases the rate of decomposition of organic matter, experiments * have been carried out recently at the Rothamsted Experiment Station, by E. J. Russell, and the purpose of this article is to present the results of these. The first step was to repeat the older work in order to demonstrate the actual fact that the fertility of the soil is increased where earthworms are present. For the purpose, plants were grown in pots, some of which contained earthworms while others did not. In the former case, the useful effect of the presence of the worms was shown by the better appearance of the plants and the higher nitrogen content of the dry matter from them. An investigation at the close of the experiment demonstrated that the origin of much of the additional nitrogen was that contained in the worms when they were put into the pots.

In order to make allowance for this effect of worms in directly adding nitrogen to the soil, in the rest of the experiments freshly killed worms, equal in weight to the living ones were put into the control pots. In the result, it was found that living worms do not increase the rate of nitrogen formation; as a matter of fact, the percentage of nitrogen was larger in the plants that had grown in the pots in which the freshly killed worms had been placed.

The next stage in the experiments was to find out if the action of worms is increased in the presence of

* Described in the *Journal of Agricultural Science*, September 1910, p. 246.

a high proportion of humus, and for this purpose the trials were repeated, the difference being in this case that plant remains were dug into the soil in the pots. Confirmation of the former result was obtained, namely that there was no action of the earthworms in causing an increased rate of provision of plant food. Further confirmation was obtained by means of trials in which a rich pasture soil was used.

The work* that has been done at the same laboratory with partly sterilized soils led to the extension of the investigation to include these, with the following result: 'It was found that addition of dead worms caused a small increase in the crop and a larger increase in the percentages of nitrogen in the dry matter and in the total nitrogen taken by the plant from the soil.'

As it had been proved, by now, that the nitrogen content of the soil is not increased through any direct action of living earthworms in it, attention was once more directed to the effects which they produce through their work as cultivators, and in this connexion trials were made for the purpose of ascertaining the rate at which nitrates accumulate in soil containing living earthworms. As was to be expected, it was found that where living earthworms had been present, the proportion of nitrate nitrogen at the end of some months was higher than in the soil which had not had the benefit of being turned over by the worms.

A further experiment was undertaken, with the object of finding out the extent to which worms are effective in mixing a grass mulch with soil. It showed that the presence or absence of worms made very little difference in the affair. Another matter of interest in connexion with the subject was that the soils used in the experiments were found to contain only a trace of ammonia; this result is in contradiction to that of other work, the conclusions from which were probably vitiated because the soil, when analysed, had been permitted to contain parts of the bodies of dead worms.

Throughout the investigation, there was no doubt as to the efficacy of earthworms in opening up the soil and thus increasing its fertility indirectly. In relation to this, an experiment is described in which one set of pots is taken and filled with soil alone; while to another, worms are added as well as the soil. In the former case the surface quickly becomes covered with algae and mosses; in the latter no such growths are seen, on account of the continual disturbance of the soil by the worms.

A summary of the conclusions that are reached at the end of the investigations shows that earthworms do not appear to have any marked direct effect in hastening the formation of nitrates in the soil. They certainly possess a direct manurial value, because of the nitrogen that is given up by their bodies when they decompose It is, however, their action in loosening the soil, and thus assisting in its proper aeration, that makes them useful aids to the agriculturist.

* See *Agricultural News*, Vol. IX, p. 33.

THE VALUE OF FIRST GENERATION HYBRIDS IN CORN.

This is the title of Bulletin 191 of the Bureau of Plant Industry of the United States of America, which describes work showing the superiority of the first generation hybrids of corn over the plants that are produced from similar parents, and indicates the practical use that may be made of the existence of this. Extracts from this bulletin are reproduced as follows:—

The use of first generation hybrids offers one of the most promising methods of increasing the yield of corn. The evidence that crossing can in general be relied upon to give an immediate increase of vigour and productiveness appears conclusive, yet the practice seems never to have been applied on a commercial scale. The plan of utilizing first generation hybrids involves the making of the cross anew each year, and this is readily feasible with corn. Many efforts have been made to develop hybrid varieties, but the increased vigour and productiveness that result from hybridization appear to be confined largely to the first generation, and to disappear gradually in later generations.

It was indicated more than three decades ago that seed produced by crossing two varieties of corn could be relied upon to produce larger crops than the parents, and that this increase was to a great extent lost in following generations.

At about the time when it was discovered that an increase in yield and vigour followed the crossing of two varieties, the attention of investigators was attracted to the possibility of the improvement of corn through what then appeared the more scientific methods of selection The latter idea was in accord with the most advanced ideas of evolution, while the former appeared as an isolated fact discovered by accident.

It was natural that investigators should follow out what appeared to be the more logical and scientific method. The fact that yields could be materially increased by simply crossing two varieties was lost sight of. Great strides have been made in the knowledge and possibilities of corn improvement by selection, but until the past few years, the possibility of utilizing the vigour of first generation hybrids of corn has remained almost exactly where it was left by the pioneer experimenters.

Even after the increased vigour of first generation hybrids became recognized as a general principle, it was not appreciated that the peculiar habits of the corn plant made its commercial application to this crop entirely feasible. Corn is peculiar among the important crop plants in being wind-pollinated, and in having the male and female flowers on widely separated parts of the plant. This combination of characters permits the production of crossed seed in large quantities, by the simple expedient of planting two varieties together and removing the tassels from the plants of one

variety, which then produce only hybrid seed. The importance of this fundamental difference between the flowering habits of corn and those of other crops has not been sufficiently appreciated. Systems of breeding developed for other plants have been applied to corn, diverting attention from this more simple method of improvement, made possible by the peculiar habits of the plant. The use of the first generation hybrids will doubtless be found applicable to other crops, but in few will its utilization be so easily accomplished as with corn.

Comparatively few recent experiments with a direct bearing on the value of first generation hybrids have been reported, but all that have been made confirm the earlier results. Taken in connexion with the experiments to be reported in the present paper, they establish beyond question that the vigour of first generation corn hybrids is a means of securing increased production that is capable of very wide application. As soon as the general public becomes acquainted with such a simple and inexpensive means of increasing the yield of this most important crop, a rapid extension of the practice should follow. The great need is for detailed information regarding the particular varietal conditions best adapted to the different local conditions. At present, the data are so meagre that experiments must proceed empirically; but the lack of detailed information should not obscure the importance of the subject, nor stand in the way of utilizing the results already accomplished.

Though the possibility of utilizing the vigour of first generation hybrids is only beginning to be appreciated from the scientific standpoint, the increased yields that result from crossing have probably been utilized unconsciously since prehistoric times. It is a regular custom among many native American tribes carefully to plant seeds of different varieties in each hill of corn. This is done for the purpose of increasing the yield. Though the expected increase is usually associated in the minds of the natives with superstitious ideas regarding sexuality in the plants, the vigour secured by such crosses may well have been an important factor in establishing this custom with primitive tribes.

The value of first generation hybrids is further recognized in a widespread belief among practical seed growers that the plants produced by accidental crosses of pure strains are often exceptionally vigorous.

After describing the work that has been done, so far, in connexion with the subject, the bulletin proceeds to the following conclusions:—

The corn plant is naturally cross-fertilized and requires the stimulus of crossing to produce maximum yields. Methods of close breeding that can be applied to other crops with advantage do violence to the nature of the plant, and tend to reduce the vigour of growth and the yield of grain.

As a result of the peculiar habits of reproduction of the corn plant, the raising of hybrid seed does not require any special skill or any large increase of labour. The cost involved is insignificant in comparison with the increased yields that are obtained.

No reason is apparent why the vigour of hybrids may not be regularly utilized to increase the yields of the corn crop. A refusal to take this factor into account would be like rejecting the use of commercial fertilizers, or failing to take advantage of the increase that may be obtained by selective breeding.

The planting of first generation hybrid seed as a method of securing a larger crop is to be considered as entirely distinct from the idea that superior varieties can be bred by hybridizing or crossing. Crosses between distinct varieties or strains at once increase the yield, but to maintain this high performance the cross must be made anew each year.

Experiments to determine the value of first generation hybrids have been made at various times since 1878, but in an isolated and disconnected manner and usually without any adequate appreciation of the possibilities of this method as a regular element of farm practice.

In the literature which has thus far been examined, nineteen crosses have been reported. With a single exception, these hybrids gave larger yields than the average of the parents, the amount ranging as high as 95 per cent. The series includes experiments in six different states and embraces a wide range of varieties.

Similar increases are here reported in crosses between the members of a new series of types of corn from China, Africa, and the American tropics, very different from United States varieties and very unlike among themselves. These experiments show that a very wide application of this principle is possible.

In addition to increased yields, there is reason to believe that the increased vigour of first generation hybrids may become an important factor of adaptation to different conditions of growth. The hybrids appear not to require the delicate adjustment to local conditions necessary to the proper performance of pure strains. The utilization of hybrids may be expected to extend the range of utility of the high-yielding types beyond the present range of adaptation of such varieties.

First generation hybrids are a distinct factor in the problem of securing varieties of corn with adaptations that fit them for special conditions. The increased vigour which these hybrids possess should make possible their growth in regions where pure strains fail, and should also provide some measure of disease resistance.

The advantage of crossing distinct varieties is equally applicable to the improvement of sweet corn, and affords a measure of protection to those discovering new and valuable combinations.

RUBBER IN CEYLON.

In 1909, the United Kingdom took a quantity in excess of the entire exports of 1908. The United States of America is our next best customer, taking double the quantity she did in 1908. After deducting Straits rubber sold in the local market, the total quantity exported was as follows:—

	cwt.
1908	7,808
1909	13,621

During the year, prices for rubber reached unprecedented figures, influenced by a very stong demand and a short supply. The record prices paid for Ceylon plantation rubber were 9*s.* 3¾*d.* per lb. in London, and Rs. 7·20 in Colombo. The year closed with a quotation at 7*s.* 7½*d.* for fine hard Para. The Chamber of Commerce reports:—

'Further points which deserve special mention are the general improvement in, and greater regularity of, quality, which have been noticeable during the year, many estates (more particularly those making use of crêpe machines) having turned out rubber of such even quality, size, and colour, that it has become customary to deal in the produce of such estates on the mark alone, without samples, which has tended to greatly facilitate business.

'Statistics relating to importing markets show the position at the close of the year to be exceptionally satisfactory from a producer's point of view, and prospects for 1910 would appear to be all that can be desired.' (*Colonial Reports*—Annual, No. 653.)

FRUITS AND FRUIT TREES.

GREEN MANURES IN CALIFORNIAN ORCHARDS.

The following extracts relating to the use of green manures in orchards, in California, are taken from Bulletin No. 190 of the Bureau of Plant Industry, United States Department of Agriculture (October 1910):—

GENERAL. The use of green manure crops for the maintenance of soil fertility is one of the oldest of agricultural practices. In California, such crops have been used in a limited way for a long time, yet it is only within recent years that their practical value has become fully recognized. The growing of these crops has attained its greatest development in the citrus orchards of the southern part of the State, where they have been longest used.

For a number of years the Bureau of Plant Industry has been working to secure better crops for green manuring than the ones now used, and to aid in the demonstration of the adaptability of the ones now being grown. The Agricultural Experiment Station of the University of California has also done extensive work in demonstrating the value of the various green manure crops in that State.

In California, the work of the Bureau of Plant Industry has been carried on in co-operation with orchardists and farmers throughout the various sections, and at the United States Plant Introduction Garden at Chico, where extensive tests have been made. This work has clearly indicated the superiority of certain crops over others and their adaptation for varying purposes and conditions.

DESIRABLE CHARACTERS OF A GREEN MANURE. No one plant possesses all the desirable qualities of an ideal green manure crop. However, in the various crops used for such purposes, practically all the desirable qualities are represented, though varying in degree. The conditions under which a green manure is to be grown determine to some extent whether a certain quality is desirable or objectionable, and must be taken into consideration in selecting the best crop to grow.

A green manure crop should be a legume wherever possible, in order to obtain the addition of nitrogen to the soil. It is also necessary that a good growth be made, in order to have a large quantity of organic matter to turn under and incorporate with the soil. With good growth should be a heavy development of nodules on the roots, as this is believed to indicate great ability to fix atmospheric nitrogen.

The quality of being able to stand trampling with a minimum of injury is very important where the crop will be subject to such injury, as in the case in citrus orchards where the picking of fruit takes place while the green manure crop is yet growing. Uprightness and non-twining stems are also desirable where an ordinary mould-board plough is depended upon for turning under the crop. However, if a disc plough is used, or the crop is worked in with an ordinary disc harrow, this does not make so much difference; and where the growth is not allowed to become too rank, little difficulty is experienced in ploughing it under.

The texture of the stem should be such as to decompose readily Practically all crops, however, if turned under at the right stage of growth, decay readily. Thus, the question of decomposition is one of turning under the crop at the right time, rather than one of selecting a crop that will decay readily.

That the cost of a green manure may not be too great, it is necessary that the price of seed be reasonable as compared with the results to be obtained

TURNING UNDER GREEN MANURES. In turning under a green manure crop the common mould-board plough, the disc plough, or the disc harrow is used. In using the first, a sharp coulter is attached, and where the vine growth is heavy a chain is also used. Sometimes the land is run over once with a disc harrow before ploughing. This enables a heavy growth to be more completely turned under. During the past few years the disc plough has been very generally used, and for turning under a heavy vine growth it works more satisfactorily than the mould-board plough.

After ploughing under a green manure crop the land is harrowed, and as the crop decays cultivation is given. This at first is shallow, so as not to bring the vines to the surface, but later a deeper cultivation is given.

In sections having a very open soil or a sandy loam, the disc harrow has been used very successfully in turning under a green manure crop. The use of this harrow has been taken up with the idea that fewer surface-feeding roots of the trees are disturbed by its use than is the case with the plough, for which reason it is thought by many to be more desirable. In working a green manure crop into the soil with a disc harrow, four discings are usually required, each discing, where the planting of the orchard will permit, being made at an angle

with the previous one. On the heavier soils, the disc harrow does not work so well, and the plough is used almost entirely.

After turning under a green manure, the land is kept well cultivated the remainder of the year.

For obtaining the best results, a green manure crop should be turned under early enough in the season to allow perfect decomposition.

RESULTS OF USING GREEN MANURES. There have been no definite tests made in California to determine the results in an increased yield of fruit or improved quality of the same from the use of green manures. The only evidence available is that of general observation and the experience of the orchardists

While orchardists differ to some extent in conclusions, they generally are favourable to the practice, as its continued and growing use attests. Careful observations also show the beneficial results of green manure crops in a more thrifty appearance of the trees, the improved condition of the soil, and a better quality of the fruit. The belief is quite general that the yield also is increased. Orchards in which a few years ago there were unthrifty trees with yellowish-coloured leaves, now, after several years' use of green manure crops, show a decided improvement in colour and general appearance. The work of the California Experiment Station has demonstrated that gummosis of citrus trees is brought on by unfavourable soil conditions, and that in remedying such conditions green manures serve a very useful purpose. Orchards in which green manures have been used for a long time are but little affected by this disease.

The improved condition of the soil, when green manures have been used for some time, has been readily noticeable to those handling an orchard. The heavier soils have become quite open and friable, and the sandier soils more loamy. Beneficial results in the conserving of rainfall and the prevention of washing of the soil have also been very apparent. Most soils that wash badly do so because they are deficient in organic matter. Green manuring, by the improvement of the mechanical condition of the soil, not only prevents washing, but the presence of the growing crop on the land prevents gullying during the rainy season. This is of particular importance on sloping lands.

DOMINICA EXHIBITS AT THE COLONIAL FRUIT SHOW.

According to the *Dominica Chronicle* for November 26, 1910, 33 packages of exhibits were sent, under the auspices of the Dominica Permanent Exhibition Committee, on November 13, 1910, to the Colonial Fruit Show to be held in London.

Below is a list of the various exhibits and exhibitors:—

Castle Comfort estate, limes; Wall House estate, limes; Gleau Manioc estate, limes; Everton estate, cacao, nutmegs, nutmegs in shell with mace, essential oil of limes, limes, oranges; Sylvania, oranges; Corona, oranges; St. Aroment, lime juice, essential oil of limes, otto of limes, limes, nutmegs in shell with mace; Ancaster Park, limes; La Haut, limes; Permanent Exhibition Committe, limes, shaddocks, oranges, essential oil of limes; Dominica Fruit Growers' Association, limes; Botanic Station, oranges, grape fruit, citron, lemons, bread nut fruit, bread fruit, nutmeg fruits, nutmegs in shell with mace, nutmegs, kola nuts.

THE NATURAL ENEMIES OF MILLIONS.

References to the natural enemies of the mosquito-destroying fish, millions (*Girardinus pœciloides*), have been made recently in the *Agricultural News* (Vol. IX, pp. 315 and 355). Further information in regard to the matter has been kindly supplied by Dr. Lucius Nicholls, of St. Lucia, whose report as medical officer of District I B of that island was reviewed on page 315 of this volume of the *Agricultural News*.

As destroyers of mosquito larvae the 'Millions' fish when thoroughly exploited, are proving themselves to be of great value in anti-malarial work. The correct method of viewing the natural enemies of these is to consider them with all circumstances that are adverse to the little fish. For the fact that some rare water creature occasionlly devours a small fish, though worthy of mention, may practically be of little or no moment.

I have performed many experiments with these fish, and have placed them under a great variety of surroundings. Circumstances that are detrimental to them may be considered under two headings:—

(1) Adverse physical conditions.

(2) Natural enemies.

In the first group are included conditions external to the water, such as, heat, cold and solar radiations, and water conditions, as brackish water, water in iron tanks, etc. To a certain extent, fish can be gradually immunized to all these circumstances except solar radiations. If they are placed in shallow water with a total absence of shade, the exposure to the sun by day and the rapid cooling at night invariably kill them. Fortunately, there are very few natural breeding places of anophelines in which the fish will be unable to find ample shelter from the solar rays.

The second part of the subject may be likewise divided into classes: (1) that concerned with enemies which destroy sufficiently large numbers to affect their establishment in the same situation: among these are the larger fish, mullets, loaches and eels, in large collections of water, and dragon-fly larvae, which are very common in tropical countries in small collections of water; secondly, that having relation to enemies which destroy a few, but practically never exterminate them: these include water-fowl, (ducks, cranes, etc.), crustaceans (crayfish), predaceous neuropterous larvae, excluding those of the dragon-fly larvae, and coleopterous larvae; in the case of the Dytiscidae, the adult beetles as well as the larvae prey upon the fish. Fortunately, water beetles are much more common in temperate than in tropical climates.

Despite this array of natural enemies, millions will survive in more than 90 per cent. of the surroundings in which mosquito larvae are found. In many localities, it is not difficult to get rid of the other inhabitants of the water.

These little fish have not yet received the general research and attention that they deserve. Anyone working with them, who will make use of them with thoroughness, and who will reason upon his successes and failures, will find them an addition of great value in his work against that terrible insect pest—the mosquito.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 21, with reference to the sales of West Indian Sea Island cotton :—

In the absence of stock, transactions in West Indian Sea Islands during the past fortnight have been confined to a few oddments left over from last season.

American Sea Island cotton remains fairly steady, but buyers are not eager and are waiting developments.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 3, is as follows:—

We have had a quiet market again this week, with only a moderate demand, resulting in sales of 50 bales full Extra Fine at 42½c. for France, and some small lots of odd bags classing Fully Fine at 37c, Extra Fine at 40c. for export to England. Besides, a crop lot, 8 bales Willow Select, was sold for France at 50c., and there are orders in the market for several more crop lots for France, but at prices below the views of the planters.

The receipts continue large, so that the unsold stock is increasing. Although there are orders in the market for the odd bags seeking execution at 1c. decline, Factors still refuse to make any concession from previous prices, because they think that the receipts, from now on, will begin to show a decided falling off, confirming reduced crop estimates.

We have, therefore, only to report, market quiet, prices unchanged, Factors still holding.

Extra Fine Islands	at	40c. = 22*d*.	c.i.f. & 5	per cent.
Fully Fine	,,	37c. = 20½*d*	,, ,,	,, ,,
Fine	,,	35c. = 19½*d*.	,, ,,	,, ,,

COTTON EXPERIMENTS IN THE BAHAMAS.

Two plots of Sea Island cotton were planted at this station on July 31, 1906, from seed purchased from the Imperial Department of Agriculture for the West Indies.

Plot No. 1. A small area of 98 square yards in black soil in the school garden.

Plot No. 2. One-sixteenth of an acre in red or peppery soil, close to the tobacco-curing house.

The first picking commenced on October 25, and continued to December 3, when the plants were cut down to test the quality of cotton from second crop.

During the growth, which was fairly luxuriant, the plants were not attacked by any insect or other pests, and the condition of the plants was all that could be desired. The total weight of seed-cotton reaped from plot No. 2 was 24½ ℔, equal to 396 ℔ per acre.

Samples of the cotton were sent to the British Cotton Growing Association, Manchester, England, for an opinion as to quality and value.

The following reply was received :—

Your letter of November 21, duly to hand, together with the samples of Sea Island cotton grown at your Experiment Station. I have now pleasure in handing you copy of valuation and report from our Expert in Liverpool.

No. 1, value 23*d*. to 24*d*. per ℔. 'Clean, very bright, staple extra fine and long.'

No. 2, value 20*d*. per ℔. 'Wanting in fineness as compared with No. 1; also less fine and lacking in length.'

Just now, Sea island cotton is fetching very high prices, owing to the partial failure of the American Sea Island crop. There is no doubt that if you introduce this industry in your islands it will prove a great success. (Sgd.) Jno. Atkins, Secretary. (From the *Bulletin of the Department of Agriculture*, Bahamas, Vol. V, No. 2.)

COTTON-GROWING IN GREECE.

An interesting and apparently successful experiment has been made in Thessaly in the cultivation of Egyptian cotton, with modern machinery and under the direction of an expert from Egypt. In 1908 about 220 acres were cultivated in this crop, which produced 210,500 ℔. The area under cultivation in 1909 was 200 acres, producing 220,000 ℔.; while this year it is probable that more than 600 acres will be cultivated. The average price received for Egyptian cotton is more than double that paid for the Greek domestic cotton. Experiments have also been made in the cultivation of cotton grown from American seed, but only on a small scale, and with results that are, thus far, inconclusive.

There are thirty-five cotton mills in Greece, equipped with 99,300 spindles and 1,211 looms, and representing a capital of £800,000. Employment is given to about 5,000 hands. The total annual product is valued at £420,000. Cotton is imported into Greece annually to the amount of 8,000 to 10,000 bales, as follows: American, of good middling quality, 2,500 bales; Turkish, 5,000 to 7,000 bales; Egyptian, 500 bales. (The *Textile Mercury*, October 1, 1910.)

LEMON GRASS OIL IN SOUTHERN INDIA.

Mr. Werner Reinhart, of the firm of Volkart Bros., of Winterthur (Switzerland), has had the courtesy to supply us with full details of the lemon grass oil industry in the southern part of British India. These particulars (for which we here return our sincere thanks to the writer) will no doubt prove of general interest. Mr. Reinhart informs us that lemon grass (*Cymbopogon flexuosus*, Stapf) occurs both in the wild state and as a cultivated plant on the western littoral of Southern India, from Cape Comorin northwards up to Malabar. As the grass requires a good deal of moisture, but does not flourish in places where the rain-water cannot percolate the soil, the cultures are mostly found on the lower spurs of the Ghats. The districts which are of the greatest importance for the distillation of oil are the back country of Anjengo, the hilly borders of the Periyar River in Travancore, and the plantation districts of Peermade in Travancore, and Nellampatty in the State of Cochin. Lemon grass oil is also distilled on the eastern side of the Ghats, and in the Pani hills. At the time when the prices of lemon grass oil ruled high, the production was increased in a senseless manner; but recently, owing to the reaction in prices following the over-production, it has been considerably reduced, the principal undertakings where distilling has been abandoned being the large plantations, which worked with expensive plant and dear labour. In some few districts, as for instance in Wynaad, the low aldehyde content of the oils produced has also had a discouraging effect upon the production. But the native peasants are apparently able to make distilling pay, even at as low a price as 2*d.* per oz.

The distillation of the oil begins shortly after the commencement of the rainy season; that is to say, about the beginning of July, and continues according to the course of the monsoon, which follows the south-west monsoon, until early in January. But on the West Coast the north-east monsoon is usually very scanty, and often remains altogether absent; it is generally necessary to stop distilling early in January, owing to the drought which then sets in. The cultivations, that is to say, the dried grass, are then burnt down, as the ash makes a good manure. In the valleys, that is in places where artificial irrigation is possible, lemon grass must give way as early as December to the cultivation of winter crops, chiefly rice.

Mr. Reinhart furnishes the following description of a native distilling plant on the Periyar River in the district of Travancore:—

The plant, which usually remains located in the same place throughout the year, is invariably covered by a straw roof resting on bamboo poles; a copper still about 6 feet high and 3 feet in diameter is erected upon a hearth built of stones about 1 foot high. There are no special arrangements for carrying off the smoke, the air having access to the fire from all sides; the stones composing the hearth are placed upon one another loosely in the form of a circle. About midway at the side of the still is an opening which can be closed by a cover, and through which the grass is charged into the still and taken out after distilling. The top of the still is surmounted by a removable helm, from which a copper rising tube leads to the condensing worm which is placed in a wooden vat about 6 feet high. Water from a well is led into the condensing vessel through a wooden gutter. The receiver is a vessel constructed on the principle of the Florentine flask, with this difference, that it constitutes a shallow but very wide cylinder without cover. The width of the receiver supplies a large surface, on which the oil accumulates, and from which it is occasionally removed with a spoon. The water which distils over at the same time flows away through a tube which points upwards, projecting close to the ground at an acute angle. This aromatic water is not, as is usually the case, used for distilling fresh quantities of grass, but is simply allowed to run to waste. For distilling purposes, the freshly collected grass tops, tied in small bundles, are fed into the still through the opening at the side as well as from above, until the still is about three-fourths full. About 1,000 bundles, of an aggregate weight of about 700 lb., go to a charge; water being added to about one fourth of the height, or about 40 gallons altogether. The opening at the side is then closed, the helm placed in position, and all the apertures carefully luted with cow-dung; after this, the fire is lighted under the still. From five to six hours are required to distil one charge, which produces a yield of 1 to $1\frac{1}{2}$ bottles of 22 oz. each. The oil is allowed to remain in the bottles for some time, in order that any water which has been removed with it may separate out, and also to allow impurities, such as copper salts, to be precipitated. It is run into galvanized drums at the port of shipment. (From the *Semi-Annual Report* of Schimmel & Co., October 1910.)

THE INTERNATIONAL RUBBER EXHIBITION, 1911.

The India Rubber World trophy, offered to stimulate an interest in improved methods of dealing with the latex of the Castilloa rubber, and to be awarded at the International Rubber Exhibition in London next year, is a silver cup of artistic design and workmanship, 50 inches in height.

CONDITIONS. 1. The cup will be awarded for the best process, method, tool or appliance for extracting the maximum amount of latex from *Castilloa elastica*.

2. Entries may be tools or appliances, accompanied by full descriptions, or drawings accompanied by descriptions.

3. There will be no entrance fee.

4. Tools, appliances, or drawings submitted for competition will be assembled as one exhibit, known as The India Rubber World Competition.

5. The cup will be the absolute property of the successful contestant. It will be presented to the winner or his accredited representative at the International Rubber Exhibition Dinner, to be held in London, while the Exhibition is in progress.

6. The judges have the right to test every tool or appliance.

7. Tools, appliances, and drawings will be returned to the owners or representatives at the close of the Exhibition.

8. While the management of the Exhibition will scrupulously protect the exhibits, they will not be responsible for loss or damage from any cause.

9. The judges' decision shall be final, and entries will be accepted only on this understanding.

10. All entries must be made to the Award Committee, International Rubber and Allied Trades Exhibition, Limited, 75, Chancery Lane, London, W. C., by Monday night, May 1, 1911. Letters bearing the postmark May 1, will be accepted as entered at the offices on that date. Entries should be sent by registered post, or delivered by hand, that a receipt may be given for them. Exhibits for competition must be sent direct to the Award Committee, Royal Agricultural Hall, Islington, London, N., but should not reach that building before June 15 and not later than June 20. Transportation must be paid on all exhibits.

The Exhibition opens June 24 and closes July 11. (From the *India Rubber World*, November 1, 1910.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for Copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial presents the results of work that has been carried out recently in connexion with the way in which earthworms indirectly increase the fertility of the soil.

This is followed by an article which gives extracts from a recent bulletin dealing with the value of first generation hybrids in corn. The bulletin discusses work which has shown that the productive power of such hybrids is greater than that of plants arising from seed which has been formed by fertilization between members of the same variety of corn.

An article dealing with the natural enemies of millions appears on page 405.

An interesting summary, having reference to insect pests in the West Indies during 1910, forms the subject of the Insect Notes, on page 410.

Page 411 contains a review of the report on the Botanic Station, etc., Dominica, for 1910.

The Fungus Notes are comprised of a useful summary of information that has been given under that heading during the year that is just ending. This appears on page 414.

Page 415 contains a note describing a simple method of destroying the carcasses of animals that have died from disease. It may be mentioned that the method of which particulars are given does not apply in its entirety to the bodies of animals that have died from anthrax, for in such cases it is not permitted to remove the entrails.

The Cotton Supply of Japan.

Information is given in *Diplomatic and Consular Reports*, No. 4511, Annual Series, which shows that during 1909, the extension in the cotton-spinning industry in Japan caused purchases of raw cotton to be made in larger quantities. The additional supply was obtained mainly from India, from which country cotton to the value of £6,200,000, out of a quantity having a total value of £11,000,000, was derived. There was also an increase in the amount imported from Egypt, so that this now has a value of more than £550,000.

An increasing amount of cotton is being obtained by Japan from Corea; the value of the supply from this country was £11,000 in 1907 and £35,000 in 1909. There are signs that this increase will be maintained; for during the first month in the present year, Corea sent to Japan 1,227 tons of cotton, worth £23,000.

Medical Wants Ordinance, Ceylon.

A Medical Wants Ordinance (No. 12 of 1910) has been passed recently in Ceylon, for the purpose of obtaining power to impose export duties on some of the agricultural products of that country. By this, the Legislative Council is enabled, by resolution, to make duties on tea, rubber, coffee, cacao, cardamoms, camphor, pepper and cinchona, exported from the island. The rates of duty are to be such as to cover expenses in connexion with the Medical Wants Ordinance for three years, subject to the deduction of the Government contribution to the extent of an amount equal to 15 per cent. of the total expense during the preceding year. When the Ordinance comes into effect, the present duties of 10c. per cwt. on tea, coffee and cacao under the Medical Wants Ordinance will no longer be collected.

The duties may be re-imposed for a further period of three years, and the scope of the Ordinance may be extended to include agricultural products other than those mentioned above.

Rebates of the export duties paid by an estate or group of estates will be granted, if the proprietor has made provision for the medical treatment of the labourers on such estates, of a nature satisfactory to the Principal Civil Medical Officer.

Agricultural Experiment Stations in the German Colonies.

A report on these is given in *L'Agronomie Tropicale* for August 1910, p. 228. It is shown in this that the agricultural interests of the Cameroons are mainly served by a Botanical Garden at Victoria. The work at this station has been attended with success, and has been chiefly concerned with the distribution of plants for use in the colony, the devising of methods of control against pests and diseases, and the obtaining of information as to suitable means for treating the products of the colony, for export. As regards forestry, the scope of the work has not increased

to anything like the extent that has been reached by matters of general agricultural import.

In German West Africa, a Biological and Agricultural Institute has been founded at Usambara, for the purpose of assisting cultivators in agricultural matters, developing the native resources, introducing new plants, and for making whatever researches are possible in relation to the plant and animal life of the colony. As regards forestry, the work is confined to watching over the forest reserves, and to introducing new kinds of trees; a staff of seventeen forest officers is made responsible for this.

As regards Togo, two stations exist, in one of which experiments are being conducted with over 150 varieties of useful plants, more especially fruit and forest trees.

In South-west Africa, the work is chiefly concerned with the raising of live stock, and with forestry. In German New Guinea, the Botanic Garden at Simpsonhafen has been dependent largely on that of Berlin for supplies of plants, with which investigations are being conducted.

In Samoa and Kiao-Chao, agricultural experiments are not carried on at present by the Government to any extent; although in the latter place there is a certain amount of distribution of plants, under official responsibility.

The Ascent of Water in Trees.

Recent work undertaken in Australia in connexion with the ascent of water in trees is described in the *Annals of Botany*, Vol. XXIV, p. 85. The purpose of this was to gain information as to the rate of transpiration, the rate of the ascent of sap, the state of the conducting tissue during transpiration and the resistance to the flow of water by stems.

The investigations showed that the rate of loss of water from the leaves is lessened when portions of the stem on which they are borne are cut off, and placed in water, as well as in ordinary cases, when the air is hot and dry. In regard to the first, it was found that cut trees absorb water at a smaller rate than that at which this liquid is evaporated by living ones.

The rate of transpiration is also reduced in branches containing air, being much higher than that when they are saturated with water. The experiments showed that a head of water from two to ten times the length of the stem may be required in order to bring about on ordinary amount of transpiration; in fully saturated stems, however, in which the vessels were large and long, a head one-fifth the length of the stem may be sufficient.

The abstract from which these matters are taken (*Experiment Station Record*, July 1910, p. 27) states that an experiment showed that a coloured liquid would rise slowly in a saturated stem kept in a saturated atmosphere. If the stem was killed, however, the rate was somewhat smaller, so that it is indicated: 'that the phenomenon is not the result of any vital pumping action that is not capable of a physical explanation.' When trees were deprived of their leaves, the rise of sap was found to be inappreciable; it is only owing to the existence of the suction which the leaves exert on the water in the wood that the pumping action is brought about.

Trade of the Society Islands, 1909.

It is shown in *Diplomatic and Consular Reports*, No. 4502—Annual Series, that the total trade of the Society Islands for 1909 was £386,556, which is an increase of £106,029 over that of 1908: the former value is greater than that of any previous year. Of the exports, copra came first, with a value of £107,404, while vanilla was next with £41,331. The chief among the other agricultural exports were cotton, cocoa-nuts and oranges, having a value of £4,319, £3,655 and £2,336. Of such products, an increase has been experienced with regard to copra, vanilla, oranges, pineapples, cotton and cocoa-nuts.

The vanilla industry of the colony has shared in the recent depression, with the result that the natives have largely ceased to cultivate the plant, and, what is more, few efforts are being made by those who still grow it to improve the quality of the product.

Prize-Holdings Competition in Jamaica.

In the issue of the *Jamaica Telegraph and Guardian* for October 22, 1910, an account is given of a prize-holdings competition that was held recently in the parish of St. Mary, Jamaica. The judging in the competition took place from September 12 to 20, and from September 27 to October 10. The number of holdings entered for competition was forty-seven, as follows: Class I, twelve; Class II, thirteen; Class III, twenty-two. The reasons given for the moderate number of entries are the exceptionally bad weather conditions experienced during the season, and the fact that no cultivator was encouraged to enter the competition unless he had a reasonable chance of gaining a prize. This policy has been found worthy of adoption, because it does not seem that the usefulness of the competition is increased by the entry of candidates who are not likely to qualify for a prize; this is on account of the discouragement consequent on their failure.

In a general way, the two matters that were brought most strongly to the notice of the judges were, firstly, the increased attention that is being given to cultivation in the districts affected by the competition, as well as the greatly improved method of taking care of the cacao and banana cultivation. The second matter was the existence of well built cottages in a district where building materials are acquired only with difficulty. In the latter connexion, suggestions are made for the improvement of the domestic conditions of the cultivators by an increase in the extent to which stock is kept by them.

Consideration is being given to a suggestion to offer prizes during the next season for the best kept cacao fields; special attention being paid to the thoroughness of the measures adopted for treating canker, and for the general sanitation of the orchards.

INSECT NOTES.

INSECT PESTS IN THE WEST INDIES IN 1910.

A brief review of the insect pests in the West Indies in 1909 was given in the *Agricultural News* for January 8, 1910 (Vol. IX, p. 10). The present account deals in a similar manner with the occurrence of pests during the year which is just ending. The information on which these observations is based has been furnished by the Agricultural Officers in the several islands of the Lesser Antilles, in response to a request by the Imperial Commissioner of Agriculture.

OF SUGAR-CANE. No serious attacks of insect pests have been reported during the past year. The moth borer (*Diatraea saccharalis*) has generally been reported as not causing any unusual damage, or as not being on the increase. In St. Kitts, it has attacked a few trial plots of new seedlings, and in the Virgin Islands it has caused some loss in the drier districts.

The weevil borer (*Sphenophorus sericeus*) has been more abundant in Barbados than for several years past, especially in heavy clay bottom lands in one of the drier parishes. The root borer (*Diaprepes abbreviatus*) has again appeared in Barbados, but the amount of damage done, and the extent of the attack, have not been reported.

It is of interest to note that the attacks of termites on sugar-cane on one estate in St. Kitts have not extended to any other estate, so far as is known at present, and the badly infested area, on which two crops of cotton have been grown and which has since been cultivated in sugar-cane for two years, seems to be free from this pest. It would appear that by planting cotton for a few years, the entire infested area might be rendered free from the termites.

OF COTTON. The cotton worm (*Alabama argillacea*) has occurred in very small numbers during the year. In St. Vincent and in the Virgin Islands, no insecticides were needed, since the natural enemies of the cotton worm kept it in check. In Montserrat, this pest appeared in considerable numbers in October and November. London purple was the insecticide chiefly used. It is reported that scorching of the leaves by the London purple occurred in certain fields.

The cotton stainer (*Dysdercus* spp.) occurred in Montserrat, in sufficient numbers to cause damage, only in one district, and not on any of the principal cotton-growing estates.

In St. Vincent, in Nevis and in the Virgin Islands, these insects were fairly abundant toward the end of the crop season, but they were kept well in check, by collecting. In St. Kitts, it is reported that they show a considerable decrease in numbers from those of previous years.

Black scale (*Saissetia nigra*) has not generally been a pest. In St. Vincent and Montserrat it has been more noticeable toward the end of the season. In Nevis it has been observed on one estate.

The white scale (*Hemichionaspis minor*) has been noticeable in certain localities in the Virgin Islands, on 'Curaçoa' cotton, but not on Sea Island.

The flower-bud maggot (*Contarinia gossypii*) has not appeared (except for Montserrat, in one report) outside Antigua, and no attack is reported in that island during the present year. The leaf-blister mite (*Eriophyes gossypii*) has only occurred in numbers toward the end of the crop, and has always been more abundant in those localities where the old cotton has been left standing. The destruction of old cotton at the end of the season, and the picking and burning of infested leaves as they appear on the young cotton, seem to be fully adequate to prevent serious loss from this pest.

The cotton plant louse (*Aphis gossypii*) has been much less prevalent in Barbados this season than has usually been the case. This insect is reported as having occurred in Antigua early in the season, but the attacks were slight.

Cutworms (not identified) caused some damage on one estate in Nevis, but were easily controlled by the use of poisoned bait.

Late-planted cotton in St. Kitts and in Nevis suffered somewhat from a disease or pest which caused the leaves to curl up and assume a wrinkled appearance. This appears to be associated with the rapid growth following heavy rains. The affected plants in St. Kitts were attacked by a small sucking insect—one of the leaf-hoppers, and in Nevis by plant lice and mealy-bugs.

OF SWEET POTATOS. The attacks of the sweet potato weevil, scarabee, or jacobs (*Cryptorhynchus batatae*) have been generally less than in recent years, and in Barbados where the attack has been particularly severe, this is reported to be especially noticeable. In St. Vincent, it is reported to occur in nearly all potato fields, being abundant in some localities. The sweet potato caterpillar (*Protoparce cingulata*) and the red spider (*Tetranychus telarius*) have been reported as occurring in a few localities, but not in sufficient numbers to cause serious injury.

OF CACAO. No reports have been received of serious attacks by cacao pests during the year. The beetle mentioned in the summary of insect pests in 1909, already referred to, appears to be *Lachnosterna patens*.

OF LIMES. The situation in regard to the attacks of scale insects is about the same as at the end of 1909. The attacks continue to be severe in St. Vincent, but in other islands, though these pests are present, no serious injury from this cause is reported for the year.

OF RUBBER. Castilloa is reported to be badly attacked by scale insects in St. Vincent, but in the other islands no serious occurrence of these pests on rubber is recorded.

OF GREEN DRESSINGS. Attacks of caterpillars on green dressings have been fairly general during the year, and in a few instances they have been severe. In Montserrat, it is reported that the larvae of the woolly pyrol moth (*Thermesia gemmatalis*) have severely attacked Bengal beans. It is advised to establish the crops early in the season, as the caterpillar does not appear until late in September. It has been noted that in at least two instances, Bengal beans covering lime trees have been untouched, while those growing on the ground between the trees have been entirely destroyed.

Ground nuts and Indian corn have suffered very little from insect attacks during the year.

It should be observed that no records are given of insect pests in Grenada or St. Lucia, as the information for these two islands has not yet reached the Head Office. As no reports of serious attacks have been received, however, it is safe to assume that the conditions in these islands are fairly satisfactory.

The weather in the West Indies during the year has been, on the whole, favourable for the growth and development of crops, and natural enemies seem to have exercised a very satisfactory degree of control over insect pests.

DOMINICA: REPORT ON THE BOTANIC STATION, EXPERIMENT PLOTS AND AGRICULTURAL SCHOOL, 1909-10.

The votes in connexion with the expenditure on the garden, from local funds during the year, amounted to £860, of which £810 was actually spent. The grant from Imperial funds was £615. A sum of £321 7*s.* 6*d.* was received from the sale of plants, cured cacao, fruits and seeds.

The report affords evidence that the garden has been maintained in good order, and that many plants of much interest in different parts of the world are being grown successfully in it. Success is also being experienced in regard to the nurseries, which now occupy an area of more than 4 acres. The plants that were sent out during the year numbered over 79,000, and there were, in addition to these, quantities of cacao pods, Para rubber seed and vegetable seeds, as well as seeds of green dressings, fodder plants, Funtumia and Castilloa, Congo coffee, citrus plants, shade trees and of various palms.

Among the more interesting experiments that are being conducted in connexion with economic plants, there are those with spineless limes, grafted citrus plants, Para rubber and grafted cacao. In regard to the first of these, an investigation that should be of much eventual interest is being conducted, with the object of devising a means for the improvement of the fruit. Useful results are being gained in the direction of the employment of budwood of citrus varieties from Florida for use on local stocks; it may be mentioned that an account of some of the most recent work in connexion with the matter is contained in the *Agricultural News*, Vol. IX, p. 356. A large amount of aid has been given at the station toward assisting planters in Dominica to obtain seeds and plants of Para rubber. Lastly, much interest attaches to the work with grafted cacao; one of the results of this has been to show unmistakably that Alligator cacao is unsuited for growing under the conditions obtaining in Dominica.

The year under report has been the wettest since 1903, 81·14 inches having been received at the Botanic Station; this amount is 3·33 inches more than the average for the past seventeen years. The returns from thirty-five stations show that the mean rainfall for the whole island is 136·13 inches.

An innovation has been made during the year by the appointment of an Assistant Curator, and there are strong indications already of the usefulness of the work of such an officer in Dominica. This is particularly in relation to the duties which take him into country districts and bring the Agricultural Department into closer connexion with the interests of planters. Other work of the Assistant Curator has included the making of observations, etc., on scale insects and their natural enemies. A matter that should prove itself of some use is that he is always available to give assistance to planters in relation to the making and testing of concentrated lime juice.

A report is presented by the Curator on the prize-holdings competition held during 1909-10. This is of an encouraging nature, and shows that by means of such a scheme the status of peasant cultivation in Dominica can undoubtedly be raised.

The condition of the lime industry is good, as is shown by the fact that the crop for the year was larger by 7,000 barrels than that of the previous year, being actually 284 000. In regard to citrus products generally, tables are given which show that the exports of lime products from Dominica during 1909 were worth £54,931. Those of the greatest value, in order, were concentrated lime juice (£21,565) citrate of lime (£11,203), green limes (£9,009), raw lime juice (£7,232). There was also an increase in the export of cacao which rose from 9,820 cwt. in 1908 to 10,844 cwt. in 1909.

A large section of the report is taken up with a description of the experiments that are being conducted in Dominica in connexion with the manuring of cacao. In a general way, it may be said that these continue to uphold the policy of manuring cacao with organic substances, and of mulching the soil beneath the trees.

The expenditure at the Agricultural School was £527 15*s.* 5*d.*; last year, it amounted to £505 8*s.* 10*d.* A sum of £17 9*s.* 1*d.* was received for the sale of plants, poultry, goats, honey, etc.

The number of pupils in attendance at the school at the time when the report was made was 18; four boys had completed their courses during the year, and were immediately appointed to positions as overseers on estates in the island. The results obtained in the half-yearly examinations have been generally good.

The experiments conducted at the school have had relation chiefly to ground nuts, cacao, green dressings and fodder crops. The records show, in relation to ground nuts, that Spanish and Carolina Running continue to maintain their superiority over the other kinds, in relation to yield. The manurial experiments with this plant have been interfered with by fungus attacks. They are being continued, however, and serve at the present time to indicate that the liming of the soil is of benefit to this crop, in Dominica. The work with rubber includes trials with Para rubber and Castilloa; the plants of both of these are doing well. Experiments that are being conducted with fodder crops show that the highest yield is obtained from Guinea grass, which seems to be approached most nearly by red Kafir corn and Para grass.

The report concludes with a list of boys trained at the Agircultural School, in which are given the names, occupations and addresses of past pupils. It serves as a useful indication of the ways in which a boy leaving such a school is likely to be employed.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated December 9, 1910, gives information as follows:—

The weather during the fortnight has been fine, and suitable for reaping and milling.

Paddy is changing hands rapidly, and the end of the present month should see very little remaining with growers.

Prices have advanced a little since last report, and we look for further advances in the near future.

Shipments to West Indian islands during the fortnight amounted to 1,200 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally, 19*s.* 3*d.* to 20*s.* 3*d.* per bag of 180 lb. gross.
18*s.* 3*d.* to 19*s.* 3*d.* ,, ,, 164 ,, ,,

GLEANINGS.

A general account of matters in connexion with the past work of Dr. Francis Watts, C.M.G., the Imperial Commissioner of Agriculture for the West Indies, appears on the '*Tropical Life* Friend' page, in the issue of that journal for October 1910.

The *Hawaiian Forester and Agriculturist*, for November 1910, states that forest products to the value of $51,161 were shipped from Hawaii to the United States in 1909. The similar values for 1908 and 1907 were $18,912 and $13,273, respectively.

Of the total value of Ceylon produce exported during 1909, the products of the cocoa-nut palm represented 22·5 per cent., and tea 56·2 per cent. There is an increase in the value of the former, among which copra attained a record export. (*Colonial Reports*—Annual, No. 653.)

A report received from the Curator of the Botanic Station, Dominica, shows that the cacao crop of that island is good, and that the pods are ripening early. As regards the lime crop, which is nearly completed, it is estimated that the increase over that of last year will be about 60,000 barrels.

A Consular Report states that the coffee crop for Guatemala for 1909-10 amounted to about 650,000 quintals (1 quintal = 101·4 lb.) of clean coffee, and that prices were good generally. It is estimated that the 1910-11 crop will reach about 800,000 quintals, and there are indications at present that good prices will again be realized.

The *Government Gazette* of the Union of South Africa, for October 14, 1910, reports that the Governor-General has appointed a Commission, to be called the Commerce and Industries Commission, for the purpose of enquiring into the conditions of trade and industries, and other matters appertaining to these, in South Africa.

According to a report by the Superintendent of Agriculture of Barbados, the present cotton crop of that island is one of the best since the cultivation has been reintroduced, if not the best. The diseases and pests that have been noted during the season, so far, are the bacterial disease causing the symptoms known as black arm and angular leaf spot, and the red maggot.

An abstract of a recent paper, contained in the *Experiment Station Record* for July 1910, p. 29, in which work is described in connexion with cyanogenetic glucosides (see *Agricultural News*, Vol. IX, p. 274), shows that phaseolunatin—the example of these bodies which occurs in the Lima bean (*Phaseolus lunatus*)—may be found in the leaves as well as in the seeds.

In June last, an Ordinance called the Importation of Plants (Diseases Prevention) Ordinance, 1910, was passed in Mauritius. By this, the Governor-in-Council is given power to restrict, or prohibit by proclamation, the importation of any articles from any country or state which, in his opinion, are likely to form a means of introducing any plant disease into the colony.

The British Acting Consul at Tamsui reports that the following was the output of the sugar industry in Formosa during 1909-10: centrifugal sugar 117,797 tons, brown sugar 81,190 tons, inferior grades of raw sugar 2,083 tons, making a total of 201,000 tons. Of these quantities, the consumption in Formosa was as follows: centrifugal sugar 2,976 tons, brown sugar 11,904 tons, inferior grade raw sugar 1,488 tons.

A letter from H. C. Prinsen Geerligs, dated October 5, 1910, in the *Louisiana Planter* for the 22nd of that month, states that beetroot has been planted in England during this year to the extent of 300 acres; the crop from this will be sent to Holland to be worked up there. This is a useful procedure, as by its means guidance will be obtained as to the new factory to be built for the purpose of dealing exclusively with English-grown beet.

In order to encourage the arts and crafts of the Colony, the Board of Governors of the Institute of Jamaica has decided to hold a ninth exhibition of objects of art and industry, in February 1911. The details of the competition show that the groups in which prizes are to be awarded include the fine arts, photography by amateurs and professionals, and needle work; though, if there is need for it, the scope will be increased to include exhibits under other classifications.

The *Report, Etc., of the Education Department*, Barbados, for 1909, shows that the interest taken in school gardening, by the children in elementary schools in the island, is well maintained. The number of exhibits sent to the Agricultural Department from such schools has, however, decreased during the year, the explanation being that the place where the country agricultural show was held was too far away from a large number of the schools for it to form a convenient centre.

The *Board of Trade Journal* for November 3, 1910, contains an abstract of a report by H.M. Trade Commissioner for South Africa, to the effect that a company has been formed, under the name of the Wartberg Starch Company, Limited, to manufacture starch, and various starch products from sweet potatos. The company, which is composed entirely of growers of sweet potatos, is building a factory in the Wartberg district capable of manufacturing 1,000 tons of starch products annually.

Through the courtesy of Mr. Edgar Tripp, Secretary of the Agricultural and Commercial Society of Trinidad and Tobago, information has been received that the following awards were obtained in respect of the Trinidad exhibits at the recent exhibition held in Toronto: gold medals, the Permanent Exhibition Committee, and Messrs. Wilson, Ltd; silver medal, Mr. Thomas Field; bronze medal, Messrs. Gordon Grant & Co. These should be added to the list of awards for the West Indies given on page 343 of the current volume of the *Agricultural News*.

STUDENTS' CORNER.

DECEMBER.

Third Period.

Seasonal Notes.

In continuation of what was stated on this page in connexion with limes, in the last number of the *Agricultural News*, attention may be drawn to the usefulness of making observations in the field at the time of harvesting the fruit. Such observations in some places will show the advantage of cutlassing, over hoeing, in lime plantations, as the former enables the fruit to be picked clean. At this time, too, an opportunity is afforded for making investigations as to the root system of lime trees. These often show that the roots are confined to a region extending to 12 inches below the surface of the soil, and, in the case of healthy plants, that this region is fully occupied by active rootlets. What information concerning the kind of cultivation suitable for lime orchards is given as a result of such investigations? Make notes of any insect pests that you may have noticed on Bengal beans during the season.

Reference has been made, several times, to the treatment of sugar-cane cuttings with Bordeaux mixture, before they are planted. With what methods of treatment of cane cuttings, before planting, are you practically acquainted? State how these may be improved. Among such methods, in addition to the one just mentioned, there are: soaking in water, and in lime water; while there is the very neglectful plan of soaking them in puddles that are convenient for the purpose, in the estate yard. What circumstances are there that make the last procedure specially dangerous?

At the times when maize is reaped, selection should be practised for the purpose of obtaining seed that is capable of producing good plants for the next crop. In performing the work of such selection, what matters should receive the chief attention, (a) in the field, (b) when the examination of the ears is being made? From what part of the ears should the grains that are intended for sowing purposes be taken? Decide, from your observations on the plants, whether they are most adapted to cross- or self-pollination. What conclusion is supplied by your observations, in regard to planting varieties of maize for the purpose of obtaining good seed, capable of yielding the most vigorous plants, for the next crop? In answering this question, the main regard must be given to the two following circumstances: manner of pollination, and the comparative vigour of plants obtained from crossing different varieties and of those arising from pollination among plants of one variety. How would you ensure cross pollination between two different varieties of maize growing in the same field?

Plants in certain parts of a field of maize are observed to show, especially on the ears, whitish swellings, which may become very large; they finally burst, after becoming dark-green in colour, and a large number of spores escapes from them. What kinds of damage may result from the presence of this disease, and what is the best method of preventing it from spreading, as well as of guarding against future attacks? (See *Agricultural News*, Vol. IX, pp. 55 and 142.) Give an account of any other disease that is known to attack maize.

Write descriptions of the different varieties of ground nuts with which you are familiar, and state what advantages and disadvantages they possess in regard to: (1) time required to attain maturity; (2) ease of harvesting; (3) resistance to pests and diseases; (4) suitability for local use; (5) suitability for export. In what ways are fungus diseases capable of causing damage to crops of ground nuts. (See *West Indian Bulletin*, Volume X, pp. 246 and 256); information in connexion with the subject is also given in the Annual Report on the Botanic Station, etc., Dominica, 1909-10, which is to appear shortly. Gain as much information as you can concerning the cultivation of the ground nut, its composition and its uses. References in this connexion may be given as follows: *Agricultural News*, Vols. VIII, pp. 137, 206, 245, 315, 372 and 404; IX, pp. 4 and 68).

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of a way of making budding tape.

(2) How would you show that the leaves of living plants give off water?

(3) Give a description of the preparation of farmyard manure.

INTERMEDIATE QUESTIONS.

(1) What differences would you expect to find between the fruit of lime trees: (a) growing in dry, sandy soil; (b) growing in heavy soils, where there is an excess of rainfall?

(2) Give an account of as much of the structure of a pitch pine board as can be seen with the aid of the naked eye alone, making references to what you know in connexion with the structure of the stem of an ordinary dicotyledonous plant.

(3) State, with illustrations, what is meant by the available plant food in the soil.

FINAL QUESTIONS.

(1) Choose a soil of a type with which you are familiar, and discuss the advantages and disadvantages of applying lime to it, with especial reference to (a) the soil itself; (b) local conditions.

(2) Give an account of the effects of tillage in relation to (a) the physical condition of the soil, (b) the effects on the micro-organisms which it contains.

(3) State what should be the chief characteristics of any fruit, with the cultivation of which you are acquainted, giving reasons for the advantages attendant upon the possession of those characteristics.

Advantages of Guinea Grass Cultivation in India.—(1) It is a most quick-growing grass, as it yields in forty-five days, a cutting 6 feet to 8 feet high, weighing 14 tons on the average per acre; (2) it yields the largest quantity of grass known in a given time from a given area; (3) it is highly nutritious, and is useful for feeding all kinds of stock; (4) it is a real perennial, and occupies the ground for at least a generation without requiring change; (5) it is the least expensive to grow, with no costly seed bill to start with, no weeding and very little interculture; (6) it is the best fodder plant for intensive cultivation as it yields a quantity of fodder which we cannot hope to get from eight times the area of juari [Guinea corn, *Andropogon sorghum*, var. *vulgaris*] at double the cost: it is a most hardy and drought-resisting fodder plant, useful in times of scarcity; (7) it is free from pests and fungus diseases, to which lucerne and other fodders are liable; (8) it always yields a good return to a cultivator, whose object is sale of fodder. (The *Agricultural Journal of India*, Vol. V, p. 365.)

FUNGUS NOTES.

SUMMARY OF INFORMATION GIVEN DURING THE YEAR.

A very short summary is given below of the information contained in the various articles published under the heading Fungus Notes in the volume of the *Agricultural News* that is concluded by this number. The information is divided up, with a view to making the summary as clear as possible, and references are given in each case to the pages on which the different subjects have been discussed.

CACAO. Two important publications on cacao canker have been dealt with during the year. The first, by Mrs. A. E. van Hall, in Surinam, attributes the disease in that country to *Spicaria colorans*, though infection experiments with the fungus were unsuccessful (p. 46). The second, by Rorer, in Trinidad, proved that in that island the disease is due to a species of the genus Phytophthora, which is also responsible for black rot of the pods (p. 222). This information is somewhat contradictory; but, at any rate, both authors agree that all the species of Nectria which have been found on canker wounds are almost certainly purely saprophytic. An interesting point of local interest that has been noted is the susceptibility of the grafted Alligator and Criollo cacaos to this disease in Dominica (p. 222).

Information on the subject of die-back disease is given on pp. 46, 270, and 382. It has been shown that the causative fungus is the same in Surinam as in the West Indies; and it is almost certain that the allied fungi described on cacao from different parts of the tropics are in reality identical with one another, and with that found in these islands. The present tendency appears to be to adopt the name *Lasiodiplodia theobromae* to indicate them all. This fungus also causes brown rot of cacao pods, and is believed to be identical with that causing die-back of Hevea in Ceylon, namely, *Botryodiplodia elasticae*. Evidence is accumulating which tends to prove that *Lasiodiplodia theobromae* can live as a saprophyte on a very large number of other plants, and can act as a partial parasite on several, under the right conditions. (See p. 254.) Recent investigations, conducted locally, have indicated that the fungus causing root disease of cacao may also attack limes. A full list of its hosts, and an account of its appearance, are given on p. 366. Some notes on pink disease (*Corticium lilacino-fuscum*) are given on pp. 286 and 382, where its occurrence on pigeon peas is also recorded. On p. 238 appears an account of some experiments conducted in Trinidad by Rorer, to test the effect of spraying cacao systematically with Bordeaux mixture. The experiments indicate that this course is highly remunerative.

RUBBER. A general summary of the diseases of rubber is given on pp. 302, 318 and 334; while a description of pink disease appears on p. 286, and information on die-back on pp. 270 and 382. Pink disease, in Ceylon, is due to *Corticium javanicum*; the causative fungus in the Straits Settlements was identified as *C. calceum*. It is possible that the two fungi are identical in Ceylon and in the Straits. Both are closely related to *C. lilacino-fuscum*. Die-back, in Ceylon, is caused by *Botryodiplodia elasticae* following the attacks of *Gloeosporium alborubrum*; in the Straits it is caused by a fungus which has been identified as *Diplodia rapax*. There is evidence to suggest that *Diplodia rapax* and *Botryodiplodia elasticae* are the same; and Petch is of the opinion that the latter is identical with *Lasiodiplodia theobromae*. A new fungus, found recently on Hevea, is *Eutypa caulivora*; its parasitism is, however, somewhat doubtful. It is of interest, since it is closely related to *E. erumpens*—a wound parasite of trees in the West Indies.

COCOA-NUTS. A short review of some recently published work on well-known diseases of this host is given on p. 254; it includes bud rot, root disease and stem bleeding disease: the two former from Ceylon and Trinidad, the latter from Ceylon alone. The root disease in Ceylon has been found by Petch to be due to *Fomes lucidus*, which is often associated with *Botryodiplodia elasticae*, the last mentioned being saprophytic on the dead roots. In Trinidad, there seems to be a possibility that both bud rot and root disease are of bacterial origin, and due to the same organism; the matter, however, requires further attention.

LIMES. There appear to be several forms of root disease attacking this host plant in the islands of St. Lucia, Dominica, Montserrat and Antigua; one only has been dealt with—that apparently due to the fungus that causes root disease of cacao. (See p. 366.) The other forms are still under investigation. Another fungus, *Thelephora pedicellata*, allied to *Corticium lilacino-fuscum*, has been described as forming superficial, violet-grey, waxy patches on the branches of limes in St. Lucia. (See p. 286.) It may be controlled by use of measures similar to those employed for pink disease of cacao.

ENTOMOGENOUS FUNGI. A general article on this subject appeared on p. 30. An interesting point contained in it is the discovery of *Botrytis eriophyes* as a parasite on the black currant mite, *Eriophyes ribis*, in England. This suggests the possibility that a similar parasite may occur on the leaf-blister mite of cotton, *Eriophyes gossypii*, which could be used as a partial means of control. *Metarrhizium anisopliae* has been found to occur on the frog-hopper *Tomaspis postica* in Trinidad, and Rorer and Urich are at present engaged in conducting expeiiments to test its value as an effective control of these insects (p. 350).

SMUT FUNGI. An account of three members of the group Ustilagineae, which contains all the fungi causing smuts of many cereals and other grasses, appears on pp. 59 and 398. These are *Ustilago maydis* on Indian corn, *Ustilago sacchari* on sugar-cane, and *Ustilago sorghi* on various Sorghums.

CHIEF GROUPS OF FUNGI. A series of eight articles has been written, giving some idea of the various characters that serve to mark off the main classes of fungi from one another, and of the different types of reproductive structures found among these plants. The series commences on p. 78, and is continued in the seven following numbers. It concludes with a tabular diagram on p. 190, summarizing the information given.

MISCELLANEOUS. Various fungi of local interest have been described, or referred to, from time to time. The economic importance of these species is very variable, but the record of their occurrence, and advice as to their control, were thought to be of interest to readers for various reasons. One of these is an unidentified root fungus found on many different host plants, including ground nuts, egg plants and tomatos. It is mentioned on p. 11, and also in Vol. VIII, p. 347. Thread blight of nutmegs in Grenada is described on p. 206, and die-back of mangos on p. 270. Some account of leaf spot of beet, due to *Cercospora beticola*, and rust of grape vines, caused by *Uredo vitis*, is given on p. 398. Finally, the results of experiments on disinfecting Indian corn seed with corrosive sublimate appear on p. 350. These show clearly that disinfection has a decidedly beneficial effect on germination, since it increases the percentage of seeds that grow, and also causes them to germinate more nearly simultaneously.

A SIMPLE METHOD OF DESTROYING DISEASED CARCASSES.

If a horse or bullock has to be cremated, we cannot do better than follow the plan recommended by General Fred Smith, whose retirement from the post of Director-General of the Army Veterinary Corps has just been noted. In India and in South Africa (where the writer served under him), a great many animals had to be burned. A trench is dug in the ground in the form of a cross, 7 feet each way, 15 inches wide, and 18 inches deep in the centre, but shelving upwards to the field level. The earth taken out of the trench is shovelled between the angles, and upon this mound two bars of iron are rested. An iron hurdle does well, as the weight is better distributed. Two lengths of railway iron are very good, and less disposed to bend with the heat, but we have, of course, to use what we can get, whether it is an old harrow or other implement, so long as it will give the support. The advantage of this cross trench is that a draught is gained, no matter in what direction the wind may be blowing. The thick wood we have gathered is first placed on the structure, and on this the eviscerated and dismembered trunk is placed; then more wood, upon which the limbs are put; a further layer of wood on the top of the limbs serves to receive the viscera Straw or shavings with some paraffin will start the fire if the wood is not sufficiently dry, but a fat animal soon contributes something to his own cremation. By this method a beast may be consumed in five or six hours, with a little stoking, of course, and raking out of the ashes to ensure the draught in the trench. As blood or liquids may have been spilled around the funeral pyre, it is well to spread the hot ashes over the place. (From the *Farmer and Stock Breeder*, November 14, 1910.)

SOME AGRICULTURAL MACHINERY AT THE BRUSSELS EXHIBITION.

The Acting Under Secretary for Agriculture for Natal has received from the Assistant Secretary to the High Commissioner for the Union in London a cutting from *The Times* Engineering Supplement for August 24, referring to British machinery exhibits at the Brussels Exhibition. Mention is made of oil tractors, steam ploughs, and threshing machines, among others; and as the description of the exhibits under these heads given by *The Times* will probably prove interesting to many of our readers, we reproduce the notes below:—

OIL TRACTORS. An agricultural tractor, with two cylinders, capable of giving 35 b h.p. and burning paraffin, is to be seen on Messrs. Marshall's stand. It is fitted with three speeds, of 2, 4, and 6 miles an hour, with reverse on the lowest. A still more powerful tractor by the same makers, suitable for heavy haulage and military purposes, was withdrawn from the Exhibition at the urgent request of the Natal Government. It had a four cylinder engine developing 60 b.h.p. at 750 r.p.m. It carried 115 gallons of paraffin in two tanks under the frame, and could haul 7 or 8 tons on good average roads for 80 or 100 miles, without the fuel or water tanks being replenished.

STEAM PLOUGHS. There are two exhibits of steam ploughing engines, representing respectively, the 'two engine' and the 'one engine' systems. In the former the plough or other cultivating implement is hauled backwards and forwards by wire ropes between two engines, which are stationary while the hauling is in progress, but move forward as each successive portion of the field is finished. The inventors of the system, Messrs. John Fowler & Co., of Leeds, show a compound engine, working at a steam pressure of 180 ℔. per square inch, which is suitable for use in connexion with it. In the other or 'one engine' system, the engine travels over the ground, hauling the plough after it. The cost of the plant for this method is less than for the other, but its application is restricted by the fact that the ground must be sufficiently hard and firm to prevent the engine from sinking in. The engine shown by Messrs. J. and H. McLaren, Limited, of Leeds, for employment in this way, is a compound working at 200 ℔. pressure, and a special widening ring can be attached to the wheels to enable it to work over land into which it would otherwise sink. The same firm shows its patent steam plough for direct traction. There are four furrows, but while one is of the standard pattern, the other has patent subsoilers, which enable the ground underneath the ploughing to be stirred without bringing the subsoil to the surface. (From the *Natal Agricultural Journal*, Vol. XV, No. 4.)

POULTRY NOTES.

INDIAN RUNNER DUCKS.

We have recently had a number of enquiries as to whether the statements made by advertisers as to the laying proclivity of this breed of ducks are correct, and supported by satisfactory evidence. We have looked into this matter for our own information, as, never having kept this breed, we had no personal knowledge of it. We find that the Roseworthy Agricultural College of New South Wales, where egg-laying contests have been carried on for eight years without a break, have this to say about the breed. In the contest going on during 1909, there were fifteen pens of ducks (six in a pen) all Indian Runners but one pen. For the five months ending September last, the records made run from 399 to 631 eggs. These were all from young ducks, and it should be remembered that this period is the winter season in New South Wales. Two years ago, the annual competitions were supplemented by two-year competitions, part of the birds in the annual competition being held over for a second year. There were five pens of ducks in this two-year contest, all Indian Runners but one. For the five-months of the second year, these five pens made records of from 430 to 582 eggs, the records for the seventeen months running from 1,454 to 1,802. Professor Thompson, who has charge of these competitions, says: 'Whatever the question is in regard to hens versus ducks, it appears as though second year Indian Runners can beat any other variety of poultry.' (The *Southern Planter*, December, 1910.)

Points of Plymouth Rocks.—The chief points in a Plymouth Rock cockerel are as follows:—Comb: single, bright-red; body: large, deep, square and medium size, perfectly straight; face: smooth, bright-red; body: large, deep, square and compact, with breast broad and deep; thighs: wide apart; shanks: medium length, stout and strong, free from feathers; colour: uniform and even throughout; size: large. The weight of a cockerel fully matured should be 8 ℔. to 11 ℔. (*Farm Life*, November 26, 1910.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR November 22, 1910; Messrs. E. A. DE PASS & Co., November 25, 1910.

ARROWROOT—St. Vincent, $1\frac{15}{16}$*d.* to 2*d.*
BALATA—Sheet, 3/6; block, 2/7 per lb.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 49/6 to 54/-; Jamaica, 47/6 to 53/-.
COFFEE—Jamaica, 59/- to 100/-.
COPRA—West Indian, £27 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 50/- to 53/- per cwt.; low middling to middling, 54/- to 58/-; good bright to fine, 59/- to 64/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/-; concentrated, £18 5*s.* to £18 10*s.*; Otto of limes (hand pressed), 5/6, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{1}{8}$*d.*; fair, $2\frac{1}{4}$*d.*; good, $2\frac{3}{8}$*d.* per lb.
RUBBER—Para, fine hard, 6/2, fine soft, 5/5; fine Peru, 5/11 per lb.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/- to 18/9; Muscovado, 11/6 to 14/6; Syrup, 9/9; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., November 25, 1910.

CACAO—Caracas, $11\frac{1}{4}$c. to 12c.; Grenada, $11\frac{1}{8}$c. to $11\frac{3}{8}$c.; Trinidad, $11\frac{1}{4}$c. to $11\frac{1}{2}$c. per lb.; Jamaica, no quotations.
COCOA-NUTS—Jamaica, select, \$33·00 to \$35·00; culls, \$18·00 to \$19·00; Trinidad, select, \$32·00 to \$34·00; culls, \$17 00 to \$18·00 per M.
COFFEE—Jamaica, ordinary, $12\frac{1}{2}$c.; good ordinary, 13c. to $13\frac{1}{2}$c. per lb.; and washed, no quotations.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 56c.; Barbados and Antigua, 50c. to 52c.; St. Croix, St. Shomas and St. Kitts, 46c. to 48c. per lb.
GRAPE FRUIT—\$2·25 to \$3·00 per box.
LIMES—\$4·50 to \$5·50.
MACE—39c. to 42c. per lb.
NUTMEGS—110's, $9\frac{3}{4}$c. to 10c. per lb.
ORANGES—Jamaica, \$1·75 to \$2·00 per box.
PIMENTO—$3\frac{3}{4}$c. per lb.
SUGAR—Centrifugals, 96°, 3·90c. per lb.; Muscovados, 89°, 3·49c.; Molasses, 89°, 3·15c. per lb., all duty paid

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Trinidad.—Messrs. GORDON, GRANT & Co., December 10, 1910.

CACAO—Venezuelan, \$11·50 per fanega; Trinidad, \$11·30 to \$11·65.
COCOA-NUT OIL—\$1·11 per Imperial gallon
COFFEE—Venezuelan, 16c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$3·70.
ONIONS \$4·25 to \$4·50 per 100 lb.
PEAS, SPLIT—\$6·20 to \$6·25 per bag.
POTATOS—English, \$2·00 to \$2·10 per 100 lb.
RICE—Yellow, \$4·30 to \$4·35; White, \$4·60 to \$4·65 per bag.
SUGAR—American crushed, \$6·20 per 100 lb.

Barbados.—Messrs. LEACOCK & Co., December 2, 1910; Messrs. T. S. GARRAWAY & Co., December 3, 1910; Messrs. JAMES A. LYNCH & Co., November 28, 1910.

ARROWROOT—St. Vincent, \$3·75 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$22·00.
COFFEE—Jamaica and ordinary Rio, \$10·50 to \$14·50 per 100 lb. scarce.
HAY—\$1·20 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$70·00 to \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·75 to \$3·50 per 100 lb.
PEAS, SPLIT—\$6·25 to \$6·50 per bag of 210 lb.; Canada, \$3·45 to \$3·50 per bag of 120 lb.
POTATOS—Nova Scotia, \$2·50 to \$3·25 per 160 lb.
RICE—Ballam, \$4·90 to \$5·30; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, December 10, 1910; Messrs. SANDBACH, PARKER & Co., December 9, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$9·00 per 200 lb., wanted	\$9·00
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	10c. to 11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	14c per lb.	16c. per lb.
Jamaica and Rio	17c. per lb.	17c. per lb.
Liberian	$9\frac{1}{2}$c. per lb.	12c. per lb.
DHAL—	\$3·80 to \$4·00 per bag of 168 lb.	\$3·80 to \$4·00 per bag of 168 lb.
Green Dhal	\$4·00	——
EDDOS—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5c. to 6c.	6c.
PEAS—Split	\$6·00 to \$6·25 per bag (210 lb.)	\$6·60 to \$6·75 per bag, (210 lb.)
Marseilles	\$4·25	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	\$2·30 to \$2·50	\$2·50 to \$2·75
Lisbon	——	No quotation
POTATOS—Sweet, Barbados	\$1·68 per bag	——
RICE—Ballam	No quotation	\$4·80
Creole	\$4·40 to \$4·75	\$4·35 to \$4·75
TANNIAS—	\$1·44 per bag	——
YAMS—White	\$2·40	——
Buck	\$2·64	——
SUGAR—Dark crystals	\$2·20 to \$2·25	None
Yellow	\$2·80 to \$3·00	\$2·65 to \$2·80
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·50 to \$5·75 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation

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